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Electrical Travellers.

THROUGHOUT the country there are thousands of men who seldom come before the footlights of our great electrical theatre of operations, yet who in the aggregate handle an enormous volume of orders for electrical goods and thereby contribute an essential service in keeping British electrical factories employed.

It may be that in so far as they compete with each other, they do not add materially to the amount of employment that would exist without them, though we must recognise that "live" men may impart a spirit of enterprise to the retailer which may stimulate public demand and increase the general turnover. In so far as British travellers are able successfully to compete with travellers representing imported goods, however, they have the satisfaction of knowing that every order that they secure in this class makes additional work for British workmen and workwomen.

We wish to pay them this tribute, as in these days of many organisations of larger and higher-sounding purpose, they are likely to be overlooked, because they are part of the merchandising detail—the commercial detail—which receives a little less attention than it deserves.

We are not sure that sufficient regard is paid even to the scattered host of men who are travelling in the Colonies and in foreign fields. We see the statistical returns showing a satisfactory total of exports of this or that class of electrical products, forgetting perhaps that everywhere—or shall we be moderate and say, in many places?—behind this business there are, in addition to the normal sources of trade, men who travel to and fro, sometimes amid many discouragements, seeking orders which shall make work in the Homeland.

We desire to direct attention specially to this purely trade topic of the electrical traveller at the present moment, in order to excite a sympathetic interest among the trade generally in the Electrical Trades Commercial

Travellers' Association, which is just one year old. We described and discussed its objects at the time of its formation, and we are glad that it has made excellent progress in so brief a period. That there is ample room for it in the chain of links of electrical trade organisation was abundantly proved by the success which attended its annual dinner on Saturday last.

A little detail that no doubt will right itself in time is the name of the body. Mr. Joyce, the popular chairman, in his speech gave two abbreviated forms—one the "Etceteras," and the other the Electrical Travellers' Association, which is more concisely descriptive. After all, travellers are still travellers however much we may desire to call them salesmen, and their operations salesmanship. With reference to the objects of the Association, they include benevolence, mutual assistance, and fraternisation. In the main the intention is to bring the travelling members of the electrical trade together and to keep them together so that they may act unitedly in regard to matters of common interest which lend themselves to associated action. Anybody who knows anything about the manifold problems that agitate the minds of such men will appreciate at once how many things there are upon which they can usefully and profitably confer if they have an organisation large and representative enough. This being so, we wish to offer our commendation in support of the movement and to urge upon trade travellers everywhere the desirability of accepting the Association's hearty invitation to them to make application for membership. Companies and firms which may have had an inclination to shake their heads doubtfully regarding the desirability of such a movement have, we understand, no misgivings to-day—indeed, some of those who are most prominently associated with it represent such concerns. The Association is not in any way a trade union, but our own experience in the editorial chair has brought before us scores of matters typical of the difficulties and anxieties of the electrical traveller both at home and abroad, many of them questions which inquirers could place before such an Association as a matter of course and receive guidance upon; topics quite distinct in character from those which occupy the mind of the trade unionist.

We have long regarded the Trade Press and the Trade Traveller as having a very similar or co-operative duty to perform. Both are designed to link up the seller and the buyer. The description or announcement in the Press of some new manufacture prepares the way for the visit of the traveller when he calls, with samples, for inquiries or orders. It is of value to him that his potential customers know in advance what he has to offer. The Trade journal is also of interest to him in keeping him informed of the new articles that others are introducing and in acquainting him with any trend of development which should be taken into account in pushing his own sales.

We repeat that, as an essential part of the body of men who are responsible for actual electrical trading operations, we wish the Association further success.

Women and Electricity Supply.

It was some years ago that we first heard the usefulness of women urged by electricity supply engineers at the meetings of the Municipal Electrical Association. Here and there they were working very successfully as canvassers by reason of their knowledge of the ways and desires of their sex in the household. Since then they have justified their appointments in many places, whether as visiting employés persuading and convincing as to the value of domestic electrical service, and helping the consumer over the initial difficulties of an installation, or whether dealing with the public in large crowds at exhibitions. We do not know their number—it would be interesting to know it—but it is considerable. There are some outstanding examples where striking personality has been accompanied by absolute conviction and ability to express oneself; women of such a type after a time become so efficient that their proper sphere is the tuition of assistants who will profit by the optimism and atmosphere of the department and become like their instructress and be ready to carry on the good work by themselves. It has been suggested that the big electricity supply authorities should lay themselves out systematically for this class of staff development; some of them are not unmindful of the service that women assistants can render, but whether we think of companies or municipalities, we wish once again to put in a good word for women, for they have natural gifts and aptitudes which we mere men do not possess, and they have a way of booking a consumer whose eye we should never catch. Yet there are, admittedly, some ladies who would prefer to talk to a man—even about electricity!

Electricity Supply Statistics.

The volume of statistical returns with regard to electricity supply undertakings, which was issued by the Electricity Commissioners in June last year, which we have described as a vast store of information, related to the years 1920-1923; its compilation must have involved an immense amount of labour, and the care and accuracy with which the work was done reflected the greatest credit on the staff of the Commission.

But events march quickly in the electrical world, and many changes take place in the course of a few years. The Commissioners intimated, when the Return was published, that they were considering the issue of supplementary returns for 1923-24 and 1924-25, and would afterwards publish annual returns. The volume already issued brought the record for municipalities up to March or May, 1923, and for companies up to the end of 1922. The whole industry is awaiting the issue of the National Electricity Supply Bill with keen interest; its provisions will be based upon recent data, and we suggest that the publication of those particulars for the years 1923-25 is a matter of urgent importance. The whole of the material for that purpose must now be in the hands of the Electricity Commissioners, and we hope that the work of preparing it for publication is far advanced; the difficulties inevitably met with in the production of the first volume having been successfully overcome, the path of the supplementary return will be much smoother, and its early issue will be heartily welcomed by the profession.

At the annual dinner of the North-Western Centre of the Institution of Electrical Engineers the President, Mr. R. A. Chattock, expressed the strong conviction that the details of the calculations upon which the Cabinet's advisers founded their conclusions ought to be made public, so that electrical engineers could form their own opinions as to the merits of the Government proposals. With this contention we cordially agree. Not only should the estimates of cost be disclosed, with regard to the high-pressure grid, the standardisation of plant, and the administration of the scheme, but also the data which led to the conclusion that the interconnection of the various districts would bring about material improvement in the general load factor, which is largely relied upon to pay the cost of the scheme and to cheapen the supply of electricity. The cost of reducing the number of frequencies in use to the uniform value of 50 cycles, which is said to be justified by the reduced cost of manufacture of 50-cycle motors, in particular, needs the most careful examination; and the load curves of the districts in which the conditions have been fully investigated ought to be made available.

At a time when a million workers lack employment, when large sums are being paid out to prop up the coal-mining industry, and when it is proposed to spend five millions a year for a long time to come on works which cannot possibly become remunerative for many years, it behoves us to examine most carefully the foundations upon which it is proposed to erect so costly a superstructure. In such a case it is not sufficient to argue that the matter has been investigated by experts; the proofs must be forthcoming, and must be subjected to the closest scrutiny. To make a mistake at this juncture would be disastrous.

The I.E.E. Dinner.

THE attendance at the annual dinner of the Institution of Electrical Engineers on Thursday last week broke all previous records, nearly 600 tickets being issued and many more applied for. The brevity of the speechmaking at this dinner, and the opportunity of meeting friends from all parts of the country at the reunion which follows, render it an exceptionally enjoyable function; it is surprising, however, how many members of the Institution are not aware of the admirable procedure which has so long characterised it, and which makes it so much more attractive than other gatherings of a similar nature.

Mr. Neville Chamberlain is always interesting, and on this occasion, inevitably, dealt with the new electricity supply scheme, doubtless anticipating that his remarks would arouse the enthusiasm of a meeting of 500 electrical engineers. If so, he was disappointed, for his references to the benefits to be conferred upon the industry and the nation by the provisions of the scheme were received with frigid silence, the only attempts at applause being accorded to the assurances that no subsidy, no nationalisation, and no more state interference than was unavoidable, were contemplated.

The President, in the presence of his Ministerial guests, who are his personal friends, refrained from criticism, and not a discordant note marred the proceedings. But the silence was eloquent.

German Activities in Russia.

IT appears that the agreement concluded between the Berlin A.E.G. and the Soviet State Electrical Trust, to which reference was recently made, was entered into several months ago, and proposes to authorise the Trust to use the German Company's patents for machinery, &c. The German Company stipulated that the agreement should be confirmed by the Russian Government, and it is now stated that the latter has ratified it. Nevertheless, some time will still be occupied with the negotiations with regard to the grant of the first proposed credit of £5,000,000 in the form of goods, namely, for the opening up of the oil fields, for which Russia requires a credit of from 12 to 24 months. In A.E.G. circles the opinion prevails that the experience hitherto gained in connection with business with Russia wholly justifies the grant by German interests of large credits for the financing of deliveries, as the transactions with the Russian contractors are said to have been as smoothly liquidated as was generally possible. It is uncertain how much of the £5,000,000 will be applied to the acquisition of steam turbines for the pipe line pumps and how much will be expended on pipes, steelwork and machinery; but it is considered that many firms and banks will participate in the business. In connection with the preceding observations, attention may be directed to one part of the annual report of the A.E.G., which states that the Company regards Russia as a large market, and much is expected from the conclusion of the new agreement, concerning which negotiations have been proceeding for the past two years. The agreement chiefly concerns the grant of licences to the Electrical Trust for the construction of machines, and for this privilege the Trust will pay royalties. After confirming the circumstance that the agreement has now been confirmed by the Soviet Government, the report states that the Company formerly worked Russia intensively, knows the conditions, and is therefore at an advantage over foreign competitors. A considerable business is being done with Russia, and no difficulties have hitherto been experienced in the matter of obtaining payments.

Electrical Research.

IT would appear that the British Electrical and Allied Industries Research Association has perforce to be content in future with a smaller measure of Government financial support. After the larger expectations, consequent upon the known and cordially expressed approval of the Inspectors appointed by the Department of Scientific and Industrial Research, the actual outcome is distinctly disappointing. The powers that be seem to overlook the essential importance of the matter; or perhaps they have never fully realised it. Indeed, it is hard to conceive how such a retrograde decision could have been made were those responsible really awake to the issues involved. There are flagrant instances where a penny saved is tantamount to a shilling thrown away. In this particular case the Government department directly involved lavishes praise upon the good work done by the Association, but the authorities have decided that during the further period of five years commencing in September of last year, the aggregate grants shall be halved, and that at the end of the five years the whole cost must be borne by the industry.

Mr. Ll. B. Atkinson, the newly-elected president of the Association, who announced the decision of the Government on Friday last, at a luncheon at the Savoy Hotel, had many trenchant comments to make in the course of a speech of exceptional eloquence and vigour. As reported elsewhere in this issue, he stated that after public and official indifference to the scientific spirit and methods, things had changed during the war; but a few years later the politicians fell back into their old ways. After referring to the prospective expenditure of twenty millions sterling to support the most backward industry in the country, he urged that "any Government, any industrial leaders, who can fail to see that research by Englishmen can accomplish any and every result convict themselves of blindness to fact, lack of logic, and lack of imagination. Research associations and research workers are not asking for charity. They are urging that the present squalid civilisation should be replaced, as it can be, by a far better one, if applied knowledge in every sphere is encouraged and developed; that instead of being a last charge upon the resources of the nation, research should be a first charge."

Half a loaf is much better than no bread at all. In that the Association knows what awaits it, it has time to prepare for the withdrawal of government support. It is to be hoped that those most intimately concerned will take a long and progressive view of matters. Research is no mere accomplishment, something merely ornamental; it is bedrock necessity. The country is handicapped enough as it is; it were the veriest idiocy to increase that handicap gratuitously by killing the goose whence came the golden eggs. The nation's foremost competitors set Britain a stern race: and in her own defence she *must* put all she knows into the effort. Her crying need is for more and more of the truly scientific temper and methods of research, not for less. So, thrown more upon its own resources, the Electrical Research Association must seek ways and means to carry on. The electrical and allied industries must rise to the occasion. The partial withdrawal of Government aid must be accepted as a challenge to greater efforts, not weakly offered as an excuse for surrender. In the present year of grace it ought to be entirely self-evident that research, rightly undertaken, is a sound proposition on practical and commercial grounds. Those who have saved large sums of money through the work of the Association know that it is so, and ought to subscribe freely to its funds.

There are still five years in hand, and much may happen in that time. Certainly much *will* happen if the people who ought to be interested, and are most concerned, will take it in hand, definitely and deliberately, to see that it shall happen. The reports of the Association show that with adequate funds important economies, comparable with the hundreds of thousands of pounds that are annually saved through the researches on buried cables, can be effected in other branches of the electrical industry. Investigations are required on a scale far beyond anything as yet attempted, in connection with the properties of dielectrics, the design of switchgear, and overhead line construction. It is useless to wait for the Government to mend its ways—the industry can and must act for itself, remembering that money spent wisely on research is repaid not tenfold but a hundredfold.

Boiler-Room Practice.

Coal Flow, Air Flow, and Steam Flow.

By JOHN BRUCE.

(*Continued from page* 251.)

Considering first of all only the indications given by the Pitot tube manometers, it is obvious that with uniform fuel beds of equal thickness, the readings should have the same value. Any change in the fire bed conditions will immediately affect the air quantity and be shown by the manometer indications.

The difference between static and dynamic heads indicated by the Pitot tube manometers increases as the square of the air velocity, and neglecting the amount of gas added to the air above the fire bed as a result of the combustion of the fuel, the pressure drops measured by the differential gauges also vary as the square of the air velocities. There is therefore, for a given furnace condition, a direct relation between all the indications. By adjusting the densities of the measuring liquids, or varying the cross section of the manometer, the instruments will then, if all mounted together, show the same liquid levels for any given correct furnace conditions.

The relations between fuel-bed pressure drop, pressure drop through boiler, total pressure drop across unit, and the relations between the various pressure drops and resistances are very excellently expressed in one of the reports issued by the U.S. Bureau of Mines, and the liberty is taken of quoting the gist of them here:—

(1) "If all the resistances to the flow of gases remain constant, the pressure drop through any portion of the path will have a constant ratio to the total drop across the unit.

(2) "If the pressure drop across the unit remains constant, the pressure drop through any portion of the path will vary in the same direction as does the resistance to the flow in that portion, although the magnitude may not be in simple proportion.

(3) "If the resistance through any portion of the path remains constant, the weight of gas passing through that portion varies as a function of the pressure drop through that portion, *e.g.*, the weight of gases passing through the unit is directly proportional to the square root of the pressure drop.

(4) "If the total pressure drop remains constant and the resistance of the fuel bed is the only variable resistance, the weight of gases will vary inversely as the resistance of the fuel bed."

The young engineer cannot do better than memorise the foregoing facts relating to gas and air flow and also prove the truth of the statements by actual measurements by draught and differential pressure gauges.

So far we have only discussed the factors relating to air flow without considering the interdependance of the other factors affecting boiler efficiency.

Let us now consider the relationship that exists between rate of air flow and rate of fuel flow.

For this purpose we will assume a coal having an ultimate analysis based on the value as fired and as set out below:—

Carbon	C = 70.0	per cent.
Hydrogen	H_2 = 4.5	,, ,,
Oxygen	O_2 = 5.0	,, ,,
Nitrogen	N_2 = 1.0	,, ,,
Sulphur	S = 1.0	,, ,,
Ash	= 10.0	,, ,,
Moisture	= 8.5	,, ,,

Then with perfect combustion the air and oxygen quantities involved and the products of such combustion will be, per lb. of coal consumed, as shown in Table I.

From the Table it will be seen that the theoretical air required for the oxidation of the combustible elements of the fuel is 9.426 lb. of air per lb. of coal, and the theoretical products of combustion, plus inert gases and the vapour from the evaporation of the moisture content of the coal, will be 10.326 lb. per lb. of coal consumed.

TABLE I.

OXYGEN AND AIR REQUIRED, AND PRODUCTS OF PERFECT COMBUSTION.

Chemical symbol	Elements in coal lb.	O_2 and air required for combustion		Products of perfect combustion.				
		O_2	Air	CO_2	O_2	N_2	H_2O	SO_2
C	·700	1·862	8·044	2·562	—	6·182	—	—
H_2	·045	·360	1·555	—	—	1·195	·405	—
O_2	·050	—	—	—	·050	—	—	—
N_2	·010	—	—	—	—	·010	—	—
S	·010	·010	·043	—	—	·033	—	·020
Ash	·100	—	—	—	—	—	—	—
Moist're	·085	—	—	—	—	—	·085	—
Totals	1·000	2·232	9·642	2·562	·050	7·420	·490	·020
Less O_2 in coal & equiv. air & N_2		·050	·216	—	·050	·166	—	—
To'als		2·182	9·426	2·562	—	7·254	·490	·020

Assuming 40.0 per cent. excess air as a value representative of efficient operating practice, then for an increment of 40.0 per cent. excess in the air requirements of the above fuel, there will appear in and additional to the products of perfect combustion—

0.867 lb. of oxygen
2.903 lb. of nitrogen,

equivalent to 3.770 lb. of air. Therefore it follows that if the foregoing coal was being burned in a steam boiler furnace with an excess air value of 40.0 per cent., each pound of coal consumed would require 13.196, say, 13.2 lb., of air.

It further follows that if at all loads on the boiler complete combustion could be effected with a constant excess air value, then a straight-line law expresses, at any load or combustion rate, the relationship existing between the air required for combustion, the coal being consumed, and the products of such combustion. These relations are shown graphically, expressed for the case given, in fig. 2.

For the point next to be considered, the rates of flow of coal, gas, and air, over a definite range, still assuming 40.0 per cent. excess air, have been extracted from the graphical values in fig. 2, and are set out in tabular form below.

TABLE II.—COAL, AIR AND PRODUCTS OF COMBUSTION. QUANTITIES INVOLVED WHEN THE COAL ANALYSED IN TABLE I IS COMPLETELY CONSUMED WITH 40.0 PER CENT. EXCESS AIR.

Lb. coal consumed per hour.	Lb. air supplied per hour.	Lb. combustion products per hour.
1,000	13,200	14,100
1,500	19,800	21,150
2,000	26,400	28,200
2,500	33,000	35,250
3,000	39,600	42,300
3,500	46,200	49,350
4,000	52,800	56,400
4,500	59,400	63,450
5,000	66,000	70,500
5,500	72,600	77,550
6,000	79,200	84,600
6,500	85,800	91,650
7,000	92,400	98,700

Now under the conditions assumed, for any rate of air flow there will be a corresponding rate of flow of gaseous combustion products through the gas passes of the boiler, and from the laws governing the flow of air and gases there will be a definite relation between the pressure across, for instance, the boiler, and the rates of flow of air, fuel, and gas.

Assume, in the example at present under consideration, that between two fixed points in the gas path, between which two fixed points the resistance to the flow of gas is constant, at a rate of flow corresponding to 35,250 lb. per hour, the pressure drop is measured and found to be 0.2 inch water gauge. Then theoretically the pressure drop at any other rate of flow, assuming of course complete combustion and the same excess air percentage, will be as follows:—

Let p = actual measured pressure drop inch w.g.
" f = rate of flow corresponding to observed p.
Then $f^2 = \kappa p$, and $\kappa = f^2/p$;
and the pressure drop for other rates of flow will be:—

$$p1 = f1/\kappa,$$

where $p1$ = required pressure drop inch w.g.
$f1$ = rate of flow at required pressure drop.
κ = constant.

For the case under consideration the pressure drop at a rate of flow of 35,250 lb. per hour is 0.2 in. w.g.
Therefore $\kappa = 35{,}250^2/.2 = 6{,}212^{100}$ (approx.).

The pressure drop corresponding to the other rates of flow will then be as set out in Table III.

TABLE III.—RATE OF FLOW OF COMBUSTION PRODUCTS AND CORRESPONDING PRESSURE DROPS.

Lb. combustion products per hour.	Pressure drop across gas path.
14,100	0.033 inch water.
21,150	0.072 " "
28,200	0.128 " "
35,250	0.200 " "
42,300	0.288 " "
49,350	0.392 " "
56,400	0.512 " "
63,450	0.650 " "
70,500	0.800 " "
77,550	0.967 " "
84,600	1.150 " "
91,650	1.350 " "
98,700	1.570 " "

These values are shown graphically in fig. 2, and a study of all the values plotted will show that, provided the complete combustion of a given coal can be effected with a definite percentage of excess air, there exists a definite relation between the pressure drop over a path of constant resistance, the rate of flow of air, rate of flow of fuel, and rate of flow of gaseous products of combustion.

All the factors so far discussed can be readily measured in definite terms by simple instruments; moreover, the measurements are such that they are easily understood, and their value is directly influenced by the principal operating controls upon which the resultant performance of the boiler unit is dependent.

The next point to be considered is the relationship between the factors affecting the rate of heat liberation, again assuming the complete combustion of the fuel and the rate of heat absorption by the heat-carrying mediums contained in the boiler unit.

The rate of heat liberation can be expressed in terms of B.th.u. per hour, and the rate of heat absorption can be similarly stated.

Steam is the final form of the medium, carrying from the boiler unit the heat absorbed from that resulting from the combustion of the fuel.

Therefore if the feed water enters the boiler unit at a constant temperature, and the steam produced for useful work has a constant state point, *i.e.*, constant pressure and final temperature, the rate of flow of steam can be substituted for the expression of rate of absorption of heat units. Rate of flow of steam is customarily expressed in terms of lb. per hour, and can be indicated or recorded in such terms by modern steam flow meters to a degree of accuracy well within the limits required for commercial operation.

Considerable controversy has often arisen over the question of a linear relation between coal consumed and water evaporated, or steam produced, over the range of duty of a boiler unit on commercial operation. This controversy reached a notable degree after the presentation of a paper on pulverised fuel before one of the Institutions about two years ago, and this in spite of the fact that the performance of the particular boiler in question, from the results given in the paper, reasonably satisfied a linear equation. Further, various experimenters have from time to time given practical proofs of this relationship. Engineers must realise that power-station operation, in the present state of the art, necessitates common-sense compromises between the ideals of mathematical precision and practical attainment.

(To be continued).

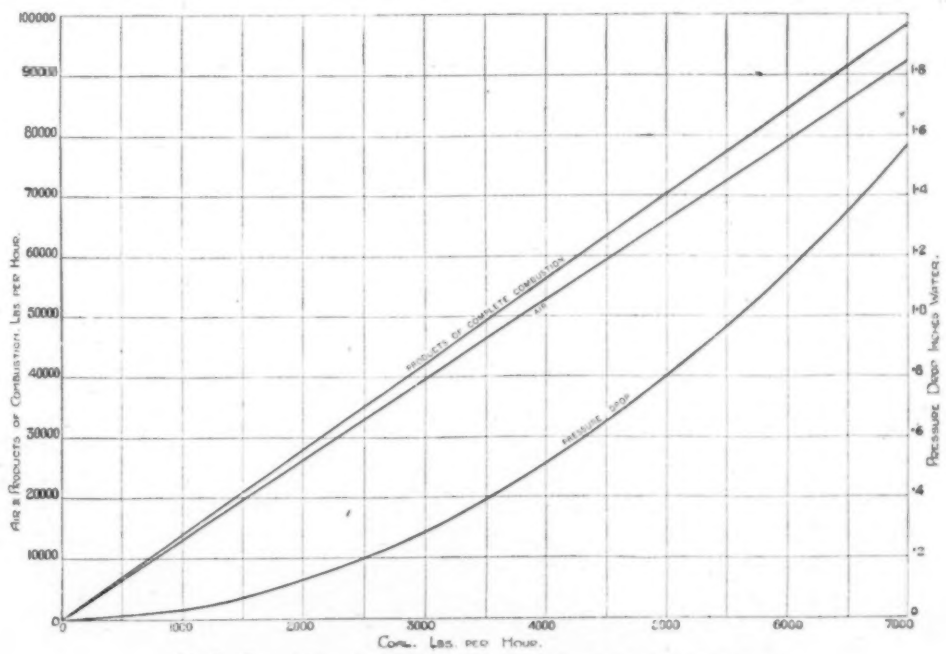

Fig. 2.—Rate of Flow of Combustion Products and Corresponding Pressure Drops.

Railway Electrification in Venezuela.—Owing to the swiftness of the motor traffic on a great concrete road in Venezuela, it is declared that a railway company has found it necessary to substitute electric for steam traction in order to keep its hold on the passenger traffic. This confession is said to have been made by the chairman of La Guaira and Caracas Railway Co., Ltd. (Mr. J. A. Goudge, C.B.E.) at a meeting of shareholders held in London. The situation in Venezuela, he said, was that they had to deal with growing traffic and growing competition, and the Board was convinced that electrification was the only course. They were now seeing the completion of the concrete cart road, and they knew that the motor-car could take passengers between the leading port of Venezuela and the capital in less time than the journey occupied by their railway with steam traction.

Laboratories for Testing Electrical Mining Apparatus.

The Mines Department's Testing Station, Sheffield.

THE official testing station of the Mines Department at Sheffield, to which we recently had the opportunity to pay a visit, has lately been established for the testing of the smaller classes of mining apparatus, sent in by the manufacturers, including miners' electric and flame lamps and electric bells, relays and the like

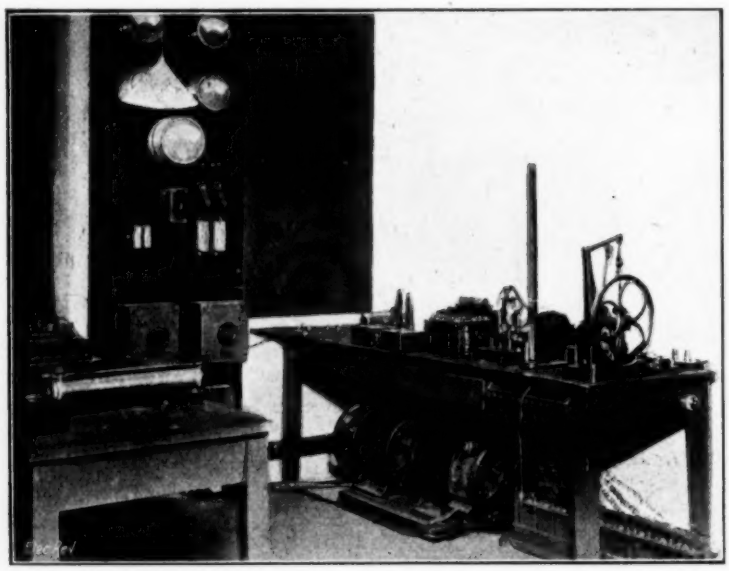

Fig. 1.—Electrical Test Room.

used in the signalling installations, in order to ascertain whether or not the samples comply with the approved specifications laid down in the official regulations. Other work, such as the analysis of samples of mine air and the dust on the mine roadways, sent in to the station by the mine inspectors, is also carried out. The dust samples are analysed to determine the amounts of moisture and combustible matter in them, while the samples of air are so treated to find out the percentages of their constituent gases.

Up to the end of last year the station formed part of that of the Mines Department for experimental work at Eskmeals, and it is due to the inaccessibility of this site that the station has been removed to Sheffield. The experimental station of the Safety in Mines Research Board has also been removed to Buxton.

The premises at Sheffield, 42, Arundel Road, occupy an old factory, which has been reconstructed and converted into laboratories, offices, and the other necessary parts of the station by H.M. Office of Works. Of the number of laboratories which constitute the station, the electrical test room, fig. 1, is probably the most interesting to electrical engineers. This room is equipped with a specially-designed motor-generator for supplying a pure sine-wave alternating current, an oscillograph which is used to obtain the characteristics of the current in various pieces of apparatus, and special equipment in which the safety or otherwise of the sparks produced between the contact points on bells and relays can be tested in mixtures of firedamp and air. The last-mentioned apparatus consists of small strong glass chambers contained in metal casings. Gas mixtures of known quantities are placed in the chambers, and by means of suitable leading-in wires with adjustable air-gaps, sparks are produced in the mixtures and the necessary observations are made and data, such as pressures and temperatures, collected. By noting on the oscillograph the characteristics of the current in a circuit in which an arc is produced, a current of a similar nature can readily be reproduced in the circuit in use with the testing chambers. The testing room is contained on the first floor, which also accommodates the main analytical laboratory, fig. 2. The work of this department is mostly of a chemical nature, consisting of the analysis of mine-dust samples. Six thousand samples of dust are sent into the station each year by the mine inspectors. A modern type of combustion furnace for the ultimate analysis of coal samples is another feature. The powdered coal is placed in clay trays in a glass tube contained in the furnace. When the coal is heated to the required temperature, oxygen is passed over it from one end of the tube, and the combustibles are collected at the other end. A number of electrically-heated drying ovens, fig. 2, for dealing with the various samples form part of the equipment. The mine-air samples are also analysed here. They are collected from the pits in small glass bulbs, which are sent out from the station in a highly exhausted condition, being, of course, hermetically sealed. The inspector, in collecting the sample, simply breaks the glass seal of the bulb, which he re-seals by means of a heavy rubber cap. After analysis of the air samples,

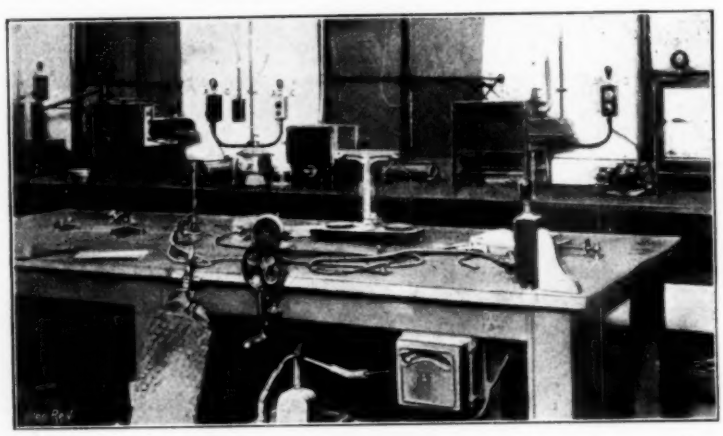

Fig. 2.—Main Laboratory.

the bulbs are re-exhausted in the main laboratory by means of high-efficiency electrically-driven vacuum pumps contained in the basement. To ascertain the degree of exhaustion in the bulbs, they are subjected to high-frequency currents in a dark room, green rays in the bulb indicating the proper vacuum. In passing, it is interesting to note that various inflammable dusts produced in industrial operations, for example, paper, cotton, sugar, and flour dusts, are subjected to

inflammability tests in this section on behalf of the Factory Department of the Home Office. The photographic dark room and a balance room, containing four chemical balances, are adjacent to the main laboratory, and on the same floor is a small research room in which investigations of a special nature incidental to the general work of the station are carried out.

On the ground floor are accommodated the offices, a photometric room and a lamp-testing laboratory. In the former, provision is made for two standard photometers, and at present the instrument which was used at Eskmeals is installed; this has been overhauled and improved technically. The lamp-testing laboratory, fig. 3, is equipped for the testing of all kinds of miners' electric and flame lamps. To the left of the illustration in question will be seen a number of electric lamps under life and efficiency tests. Special testing boards are equipped for the efficiency trials and also for determining the discharge of the accumulators under given conditions. An electrically-heated oven, in which the well glasses of the flame lamps are dealt with, is a feature of this room. The glasses are heated up to 212 deg. F. in a suitable container and then immersed immediately in cold water. An apparatus for the observation of flame in still atmospheres is an interesting feature. Firedamp mixtures are pumped into an inverted glass chamber, fig. 3, by means of an electrically-driven fan, the percentage mixture of air and firedamp being regulated by means of drilled metal disks, which are inserted in the control valve. A mercury-suction air pump, in which an electric arc is produced in the container, is used for determining the inflammability of the mixture.

The basement at present accommodates the necessary stores and workshops, and a lamp gallery is now under construction. In the workshop is housed a Crompton motor-generator with the necessary control gear for the d.c. supply throughout the station. The vacuum pumps are also housed here, and are connected by piping to the various points in the laboratories where vacuum is required. A motor-driven blower also supplies compressed air to the main laboratory for glass-blowing and miscellaneous purposes.

The lamp gallery has been redesigned, and is a modification of that previously used at Eskmeals; the essential principles of utilising vaporised pentane and air as the explosive mixture has been retained. Explosive mixtures travelling at a velocity of 1,200 ft. per minute and more will be available for testing miners' flame safety lamps. An explosion chamber for the testing of miscellaneous apparatus in still explosive atmospheres, and an equipment for testing the mechanical strength of miners' lamps is also installed in the basement.

The testing superintendent, Captain Platt, to whom we are indebted for the above details, has asked us to state that he is anxious that the mining industry should realise that he is concerned not only with the carrying out of strict tests as laid down in the official regulations on the testing of apparatus, but that he desires, where possible, to be of assistance in such matters as come within the field of his activities; he invites those interested in the improvement of the efficiency of miners' lamps and kindred apparatus to communicate with him, when he will be pleased to offer facilities for tests of an experimental nature. The official regulations stipulate that a fee be charged for the test of miners' lamps, and in special cases the amount of this fee is left to the discretion of the testing officer. At the same time, he wishes to point out that, where a manufacturer or designer is anxious to improve the efficiency of his product, no difficulties will be placed in his path in the matter of having preliminary tests and experiments carried out at the station, and for this a fee will not always be required.

The Mining Electrical Testing Laboratories of Sheffield University.

Apart from the work of the official Mines Testing Station, a very important branch of the testing and research operations in connection with mining electrical apparatus, that dealing with flame-proof electrical machinery, is undertaken by the Mining Department of Sheffield University. The work is divided into two sections—experimental and testing—the former being devoted entirely to research by the Safety in Mines Research Board, while the testing of manufacturers' apparatus is undertaken by the University department proper. The testing laboratories are maintained by testing fees, although no profit is made, and the fees vary according to the amount of work entailed. The research room is equipped mainly for investigations in connection with the flame-proof design of electrical machinery and particularly in determining the behaviour of ignited gases and flame inside an electrical-machine enclosure. For the necessary experiments spherical explosion vessels are used. These are constructed in two cast-metal hollow hemispheres with flanged joints, one half (top) being fitted with adjustable electrodes, so as to provide an electrical ignition at any point in the sphere. For the investigation of the desirability of, and the effect produced by, vents between the flanges, small brass distance pieces of given thicknesses are placed between the two halves of the globe, which are

Fig. 3.—Lamp-Testing Room.

then clamped together. The bomb is placed in an explosion chamber, two of which are installed in the laboratory in question; the bomb and the chamber are filled with gas of a required mixture. A spark is then produced in the sphere and the necessary observations are made. It will be obvious that by this means a wealth of information concerning both the gases and the protective measures is obtainable. The air gaps are varied by means of the distance pieces, and the flange-widths are also varied by inserting flat metal rings of differing widths between the sections. The explosion chambers are of wooden construction with relief-valve "windows," the valves consisting of white paper, smeared with linseed oil, suitably secured over apertures by means of frame flanges held by wing nuts. The gas used for these experiments is obtained from the Cymmer Colliery, South Wales, and contains 88 to 98 per cent. methane. The mixtures are made up in two gas holders; these are of 10 and 20 cu. ft. capacity respectively.

All manner of electrical mining apparatus received direct from the manufacturers is tested in an adjacent laboratory. This is equipped with a large explosion chamber designed to accommodate all sizes of mining machinery, up to a normal-size coal cutter, which of necessity must be flame-proof. This chamber is of similar construction to the smaller ones. It is built of pitch pine, the internal surfaces being treated with fireproof asbestos paint. The front and top of the chamber are removable, and in order to facilitate the handling of heavy apparatus, suitable blocks and

tackle are suspended from the overhead girders of the test room. For testing small apparatus, the chamber can be sectionalised by means of a central partition. To ensure the complete diffusion of the gas inside, a 16-in. fan is employed; this is driven by a fractional h.p. electric motor mounted outside on the chamber roof. When a piece of machinery is to be tested, the casing or enclosure is suitably drilled to accommodate a connection to a manometer or pressure recorder, which is used in connection with all such tests, a sparking plug for igniting the internal gas (an ordinary automobile plug is generally used), and the necessary connection for the gas inlet. Although, of course, the primary object of the tests is to ascertain whether the apparatus under test is explosion proof or not, much valuable information is obtained from the records of the manometer. The internal pressures are communicated to a small piston contained in an oil-filled cylinder. The movement of the piston is transmitted to a flat spring carrying a stylus, the latter pressing lightly on a smoked paper chart on a revolving drum. The time records are made by two Deprez time markers. One of these is connected in circuit with an electrically-vibrated tuning fork, making a given number of vibrations per second, enabling the time scale, from the rate of rotation of the drum, to be calculated. The other marker is connected with the primary circuit of the sparking coil and records the actual instant of ignition, and shows a typical time-pressure curve taken from such a test. A sampling-vessel at the back of the chamber is employed for the collection of samples of the gas from the interior of the apparatus under test or the explosion chamber. The samples are subjected to analysis for determining the exact composition of the mixture in the casing.

A certificate, recognised by the Mines Department, and a report of the test results, are issued by the University for each piece of apparatus which passes the standard test, but with a view to assisting the makers in improving the design of their plant or in developing new lines in mining machinery, the laboratories undertake special tests and provide the manufacturers with the full results. It is interesting to note that for the standard test the most explosive gas mixture is used, containing 9.5 to 10.5 per cent. of methane. In the case of motors, tests are made both with the motor stationary, and running at normal speed with resulting turbulence. The effect of the turbulence of the mixture is to hasten the rate of development of the pressure when the gas is inflamed. The ignition spark is obtained from an ordinary induction coil with a pre-measured current.

The two departments, research and testing, while under quite independent authorities, work in very close co-operation; and the data obtained by one are fully at the disposal of the other.

In conclusion, our thanks are due to Professor I. C. F. Statham, B.Eng., of the mining department of the University, for his courtesy in placing the above information at our disposal on the occasion of a recent visit to the laboratories.

The Cologne Wireless Show.

Some Impressions of the First Radio Exhibition in West Germany.

(From Our Special Correspondent.)

THE Exhibition at Cologne revealed the important fact that German manufacturers have made great strides in the production of wireless apparatus, particularly in the direction of good and cheap parts and accessories. A general review suggests that they have not yet made up the leeway lost through special post-war circumstances, but they are marching forward and intent on making good the boast that Germany will, before long, compete on equal terms with the United States and Great Britain in the laboratory and in the outside radio field. It does not require a great deal of imagination to believe this, for it has been seen what Germany can do in the electrical world, and her efficiency in this direction is proof of her ability to succeed in "wireless."

Die Westdeutsche Funkaustellung opened (January 30th to February 7th) under the management of the Reichsverband Deutsche Funkändler (Union of German Radio Dealers). While Government duties and the Vienna Conferences prevented the Minister of Posts and Dr. von Bredow (the father of German broadcasting) from being present at the opening ceremony, the Exhibition was given an enthusiastic send-off, and was immediately besieged by great crowds of visitors, who showed the liveliest interest in what, to most of them, was an entirely new art and entertainment; for the Cologne bridgehead has not known wireless, since the allied military forces in occupation on the Rhine forbade its use. But on January 30th the last of the occupational troops left Cologne, the territory became free, and automatically the wireless ban was lifted. Nothing could be more natural than that the Exhibition should, in these circumstances, take on the air of a national demonstration, and the keenness of the crowds which flocked to the permanent Fair Buildings was perhaps keyed up as much by this spirit as by a suddenly-awakened interest in radio-telephony. The Exhibition became a wireless educational centre for those of the inhabitants who had heard of, but never experienced, the joys of radio, and it must be said the stand-holders rose to the occasion and freely initiated inquiring minds into the mysteries of the new entertainment. Authority also did its best, for it was desirable that what happened after the Ruhr evacuation should not be repeated. Then, many of the inhabitants of the district were defrauded by unscrupulous vendors of obsolete and worthless wireless equipment, the ignorance of the people on the subject being taken advantage of to such an extent that the sound, straight, trader was in danger of suffering considerable harm by the natural reaction.

The Ministry of Posts, therefore, took a large space at the Exhibition, and provided a kind of museum, which included some of the earliest apparatus experimented with, and showed development down to the most modern installations. There were included the first Lorenz-Poulsen generator for telephony, a Tessler arc generator, a Braun coupled-transmitter with sparking gap and resonance inductor, several valve transmitters, variometers, Telefunken's first valve transmitter in direct connection or working off an aerial, and Thomson's experiment, which shows the inductive effect of alternating current on a conductor placed in the magnetic field. Modern short-wave transmitters and receiving-station equipment occupied another part of the museum, with a model of the Berlin-Hamburg train, which is equipped with wireless telephony for service while running.

The Institute of Physics of the Cologne University had a display of advanced apparatus built by the students, who were present to give information to inquirers, while it having been aranged to transmit music and speeches to the Elberfeld transmitting station for broadcasting—Elberfeld being nearest to the Cologne area—a special audience chamber had been constructed with one side made of sound-proof heavy plate glass. Visitors could in this way see the performers before the micro-

phones and get the music back from Elberfeld on the earphones. A Reiss microphone was employed, while two other microphones served for the loud-speakers in the entrance hall and the concert room in the East Gallery, where a giant 10-ft. loud-speaker (by Otto Gennrich, of Düsseldorf) was in operation.

In one wing of the gallery the West German Radio Union displayed apparatus built by members, while in the two main halls practically all the important German manufacturers were represented. It was noticeable that valves and loud-speakers of all makes were predominant, with very efficient earphones, which were comparatively cheaply priced, 10s. 6d. being the figure for the best. Of receiving sets, all kinds were exhibited, but the chief demand was for the two-valve set, the prices of which ranged from £5 to £6. The reason for the run on this particular type of set was the earlier experiments which proved simple crystal sets to be pretty well useless in Cologne, which has no transmitting station in the area. The two-valve set, however, is good enough for most of the German stations, and the cost is little more than that of the simpler instrument.

While the Exhibition became a particularly patriotic affair, its supposedly international character was not entirely lost, for British, Scandinavian, French, and other nationalities were exhibiting and received satisfactory attention. Among the British firms were Marconi's, with the "Sterling" loud-speaker, &c.; Wireless Equipment, Ltd., exhibiting the "Perfex" aerial; and Neutron, Ltd., which reported good business with its particular wares.

In conclusion, it may be remarked that the display was a retailers' show, for German manufacturers did not exhibit on account of the expense involved, but they gave the Exhibition their support. There were over 100 exhibitors, and the novelty of the show was a five-electrode, single-valve, receiver which works a loud-speaker at a distance of 30 miles from the transmitting station.

The Testing of Transformers.

Some Observations on a Method of Ratio Testing.

By D. PEDLEY.

In the Institution of Electrical Engineers' paper by Messrs. J. L. Thompson and H. Walmsley* there appears to be a serious discrepancy in the authors' method of ratio testing which needs to be pointed out.

In the first place, in fig. 1 of their paper, which I have, I think correctly, reproduced in fig. 1 herewith, it will be understood that when the switch s_1 is closed, the field-coil windings of the wattmeter are directly connected across the high-pressure supply; quite obviously, unless the wattmeter is specially designed (I may emphasise the word "specially") this method of connection is inadmissible.

From a perusal of the article I am inclined to think that Mr. Thompson intends the field coils of the wattmeter to be connected in series with the h.p. winding as I have shown in fig. 2.

Such a method of ratio testing is no doubt workable; but I consider that the degree of accuracy obtained would not be all that is to be desired, and in the testing of instrument transformers would be inadmissible for the following reasons:—

It is obvious from an examination of the circuit that the fundamental principle of this method of testing depends on the fact that when the wattmeter indicates zero, there shall be no current flowing from the l.p. winding, through the shunt coil of the instrument, to the resistance r; or, in other words, that the p.d. between the points $a\ x$ shall be exactly the same as the p.d. between the points $b\ x$. If any current is flowing through the shunt coil of the wattmeter, there would be a p.d. between the points $a\ b$, and calculation would be necessary to include the resistance between $a\ b$ in the resistance r referred to by Mr. Thompson; also, further calculation would be necessary to ascertain what the indication of the instrument should show.

Assuming that the above condition holds good, *i.e.*, that there is no current flowing between a and b, we require to assure ourselves that the wattmeter will indicate zero.

Further consideration leads us to the fact that the wattmeter will only indicate zero, even under the above conditions, if and when the transformer has no phase error: *i.e.*, it may be possible for the instrument to indicate zero, when there is a slight current through the shunt coil.

It is well known that all transformers possess phase error, since even in specially designed instrument transformers it is not eradicable. It is difficult, and of little use, to estimate the error caused by the above, since it may either add to, or subtract from, a possible phase error of the instrument itself.

I would therefore like to draw attention to a modification of the above method, as indicated in fig. 3, which is free from its defects, and possesses all its advantages, together with some others. The principle of the test is as before; *viz.*, that the value of the resistance r is so adjusted that there is no difference of potential between the points $a\ b$, thus the instrument will indicate zero, and the ratio of the voltages $H_P/L_P = R/r$ as before.

It will be noted that this method is free from the effects of phase error in the transformer, since we are actually measuring current, or rather the absence thereof; whereas in the previous method we measure current × cosine ϕ, where ϕ = the angle of phase error in electrical degrees.

This method is at once simple, since it is easily connected up and requires only one instrument observation; and, at the same time, accurate, since a minimum of calculation is required, and the important portion of the apparatus, *i.e.*, the resistance, is not liable to alteration.

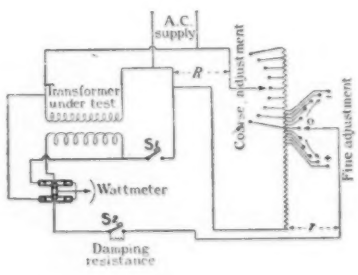

Fig. 1.

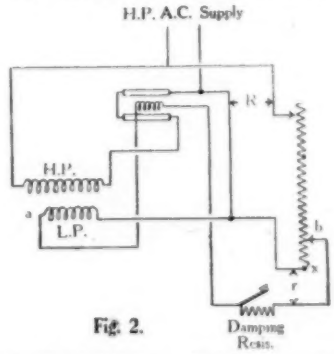

Fig. 2.

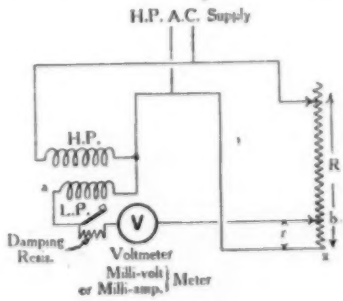

Fig. 3.

* See ELEC. REV., January 29th, 1926, p. 196.

The British Industries Fair—II.

Electrical Features and Meetings.

THE British Industries Fair is now in full swing. Unfortunately we have to go to press too early to enable us to report the proceedings of the principal electrical day—Wednesday—but at the Press inspection on Friday last we saw enough of the Electrical Section at Birmingham to enable us to speak with knowledge concerning its forward state and its business-like character. On Monday the official opening took place.

Before proceeding to particularise the numerous electrical and allied exhibits that appear in the Electrical Trade Section and those which appear elsewhere—some firms had selected their positions before it was definitely known that the electrical section would be so successful and they were unable to transfer—we think it will be appropriate if we refer generally to the various directions in which credit is due for the unquestionable success of the movement.

In November last it was feared that notwithstanding the strength and extent of the British electrical industry and its export trade potentialities, electrical products would be few and far between. Mr. T. R. Martin, of Messrs. J. H. Tucker & Co., and several other electrical gentlemen moved in the matter, and at the suggestion of Mr. Martin and the Birmingham Chamber of Commerce, we went down to investigate the situation. We have been closely interested in the British Industries Fair from the moment of its birth when the ELECTRICAL REVIEW was conferred with by the Government authorities in these offices shortly after the outbreak of war, and it has always been a matter of some surprise to us that the electrical trade has not previously risen to the occasion. We believe that at the beginning want of space and pre-occupation with the war were to blame for the lack of enthusiasm on the part of electrical manufacturers. Then Wembley was a costly undertaking which compelled our firms to neglect the Fair. This year was regarded as an appropriate time for a re-awakening of interest, but there was no enthusiastic effort made until December. Considering that only about two months have elapsed since that effort was born, it is obvious that credit lies in certain directions, and we wish to give unstinting congratulations where they are due. Of course, without publicity and earnest appeal through the Press, little could be expected. Therefore, as we thoroughly agreed with the objects of the originators, we gave the subject prominence and force in the ELECTRICAL REVIEW. The efforts of Mr. T. R. Martin in taking the initiative and of the small electrical committee that was appointed at the meeting held in Birmingham on November 24th; the work of Mr W. A. Gillott, as secretary of the Electrical Trade Section (who undertook space-selling to the electrical firms, we believe, at the suggestion of Mr. Dunlop); the service rendered by Mr. E. J. Jennings, secretary of the Birmingham Corporation Electric Supply Department, as Honorary Secretary of the Electrical Trade Section; the enterprising co-operation of the Birmingham Corporation Electric Supply Department in putting down additional plant at considerable outlay to meet the needs of exhibitors for so brief a display;—all of these have been co-operating factors which made so good and so quickly-executed a show possible. Last, but by no means least, congratulations are due to the eighty or more manufacturers of British electrical products who so readily decided to take space when Mr. Gillott approached them. We believe that if there had been another fortnight in which to arrange matters, half as much space again could have been let.

It now remains to be seen what results will be obtained. It is recognised that the show is more or less an experiment this year. If it is found that Press publicity and the efforts of the Department of Overseas Trade are the means of bringing together the right class of Overseas buyers in sufficient number and if the various organised visits secure the presence of many Home buyers of electrical goods, it will be easy for the electrical industry to make up its mind with regard to the place of electrical goods in the Birmingham Fairs of future years. While the Fair is open, exhibiting firms and others will be forming their own judgment on this and on several other points to which we shall allude later.

The First Function.

The "Press view" of the Fair took place on Friday, February 13th, and Mr. H. E. Parkes, President of the Birmingham Chamber of Commerce, who presided at the luncheon, stated that that body believed in the future of the Fair; and in his opinion it would supply an eloquent reply to those who imagined that British industry was decadent.

The toast of "The Press" was submitted by Mr. R. C. Rodgers, chairman of the Management Committee, who stated that there was no place in the world where the buyer was enabled to visualise under one roof such an immense variety of hardware, and of the allied trades' goods. The stands if placed on end would extend a distance of eight miles. As newspaper men they doubtless appreciated the importance of continuity in advertising, and he was sure they would equally recognise the importance of continuing the Fair as an annual fixture.

Mr. A. H. Bridge (ELECTRICAL REVIEW) replied on behalf of the Technical and Trade Press. Speaking of the Fair, he expressed the view that the present electrical display would really mark the beginning of a great electrical section, and that it would become a permanent feature. The electrical industry had been described as one of the bright spots in the industries of the nation. He thought it was going to make a trade atmosphere that it had never made before. He agreed with Mr. Rodgers that the idea of continuity year after year should be pressed home. There had never before, in his long experience, been brought together such a collection of electrical trade articles in market form in so short a space of time. When some of them went down in November and saw the empty buildings that were available for an electrical show they thought it would be very satisfactory if some 50 electrical exhibit shop stands could be secured and prepared within so short a time, but it had been proved that they were not as optimistic as they might have been. Everything depended now upon what happened during the next fortnight. "I hope," he concluded, "that this section of the fair will turn out to be the nucleus of a great annual electrical market."

We commence below descriptions of the exhibits of electrical and allied firms:—

The Chloride Electrical Storage Co., Ltd.

This company exhibits a full range of its batteries for all applications. Among the latest products shown are the company's h.p. batteries for radio work. These are made up in 24-V units in a multi-compartment glass box, or in 20-V units assembled in separate glass boxes. The usual range of batteries in celluloid cases is also exhibited as well as various patterns in glass containers. Higher capacity batteries similar to those used by the B.B.C. are available for inspection, and other types include those for marine radio installations and lifeboat sets and for emergency lighting and gyro-compass operation on board ship. Exide "Iron-Clad" batteries for traction purposes are included, and these are cut away to show the details of the special construction of the cells. Among the smaller types which are shown are cells suitable for miners' hand lamps and for other portable lamps. In contrast with these small models, large cells suitable for the under-water propulsion of submarines are exhibited. The "Lux" battery, specially designed for train lighting, is another type shown and other lighting batteries suitable for country houses, &c., are included. Photographs of Chloride batteries installed in some of the largest power stations in the country appear on the stand, and specimen plates of these large batteries are among the exhibits.

W. Canning & Co., Ltd.

The most recent developments in electro-plating and polishing equipments are exemplified in the exhibits of this company. One of the principal items is the "Rotamatic" electro-plating plant—an automatic apparatus in which the work travels horizontally through the solution. It is claimed that this ensures a uniform thickness of deposit while the solution is continuously filtered and returned to the bath. Electrical elements for heating electro-plating solutions, and enamelling stoves form the subject of another exhibit. These are designed in 110-V units in order that they may be used with any electrical supply. A new type of totally submerged electro-plating barrel and a heavy geared barrel for ball burnishing, together with specially designed resistance boards are also shown. The remainder of the stand is given up to low-voltage dynamos and motor generators for electro-deposition, polishing lathes, grinding machines, and materials used in the electroplating and polishing industries.

George Nobbs, Ltd.

This stand is devoted practically entirely to electric water heating apparatus. In addition to the well-known "Genii" immersion heaters, of which various patterns are shown, the application of these to a number of appliances is exemplified. The "Genii Vectis" water heater shown has a double-jacketed hard-rolled copper body well lagged with heat insulating materials. It is supplied with a loose double-jacketed top covering, a hot water outlet nozzle, and a cold-feed boss with control valve. There is a special immersion heater for constant and booster loadings. The latter range from 150 to 1,000 W to 500 and 1,500 W. The appliance is of neat appearance. The

Fig. 1.—The "National" Calorifier.

"National" calorifier, another exhibit, also has a body of double-jacketed hard-rolled copped lagged with special heat insulating materials, and the range of constant and booster loadings is the same as in the "Vectis" pattern. This calorifier is illustrated in fig. 1. For domestic use a special wall or bulkhead model is shown. This is made in a wide range of sizes, but the main principle is that when the cold water inlet valve is opened the water enters at the bottom of the tank. This pushes the hot water through the internal overflow pipe and out at the hot water nozzle; the cold water, it is said, does not mix with the hot water, but pushes it before it. These heaters are constructed of copper tinned inside and with a polished copper or nickel-plated finish. Hot-water radiators form another section of the exhibit. These are all of neat appearance and consist of cast-iron radiators in "column" design, each unit of which is fitted with an immersion heater. Patterns for affixing to walls or to stand independently are shown. A further exhibit is the "Genii" electric wash boiler. This is a hard-rolled copper tank, with a capacity of 12 gallons, mounted on three legs. It is provided with 3 or 4 kW loading.

The Falkirk Iron Co., Ltd.

Electric cooking appliances form the main exhibit of this company, a number of new patterns being on view. Among the new models is the "Falconette" cooker which has been

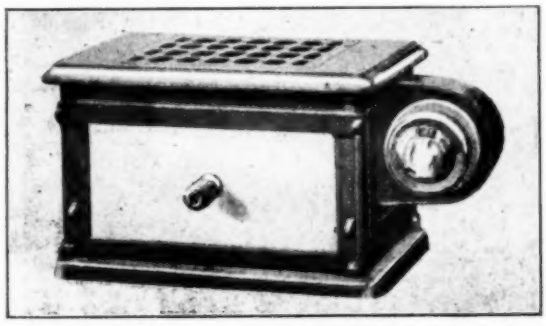

Fig. 2. A "Falco" Breakfast Cooker.

specially designed for use in small flats and is suitable for a family of two or three persons. The oven has a bottom element only; there is a grill in the hob, which also serves as a boiling plate. The total loading is 2,250 W. The oven is 9 in. wide, 12 in. deep, and 10 in. high; the overall height is 22 in. Several other types of household cookers are shown, and they are remarkable for their very fine finish, most of them being fitted with porcelain enamelled casings. A new type of boiling plate is being employed. This is very strongly made and can be simply removed or placed in position by everyone. It is of the enclosed type and the elements are carefully protected from harm. Among the larger apparatus shown is a double oven range. The ovens are of different sizes and the doors are fitted with white porcelain enamelled panels. There is a large grill, and five semi-enclosed boiling plates. The total loading of this range is 14 kW. A number of smaller appliances are on view, including breakfast cookers, which are really miniature ovens. The pattern illustrated in fig. 2 is 16 in. wide, 10½ in. deep, and 8½ in. high overall. It weighs 32 lb. and the total loading is 2,000 W; a single element serves for the oven or for boiling, frying, &c. Boiling plates, irons and fires are also shown. Among the last is an illuminated dog grate type.

The English Electric Co., Ltd.

This company draws attention to one of its most recent manufactures, a 12,500-kVA, 110,000-V transformer (fig. 3), which is one of 12 built for a power transmission scheme in India. The size and weight of the transformer precluded the exhibition of the actual article, but a part of it appears upon the stand, together with photographs and other details. Each single-phase unit has a maximum output of 12,500 kVA at the B.E.S.A. rating of 65 degrees C. rise as measured by resistance corrected to the instant of shut down, and is of the water-cooled core type. The secondary windings are for 23,000 V; the primary windings are connected in delta and the secondary windings are star-connected. The specified test pressure with which the units have complied was 240,000 V between windings and core, and the whole of the high voltage winding had to be insulated for this condition. Owing to the large size of the transformer, it has been found necessary to include many special features of design, including provision of

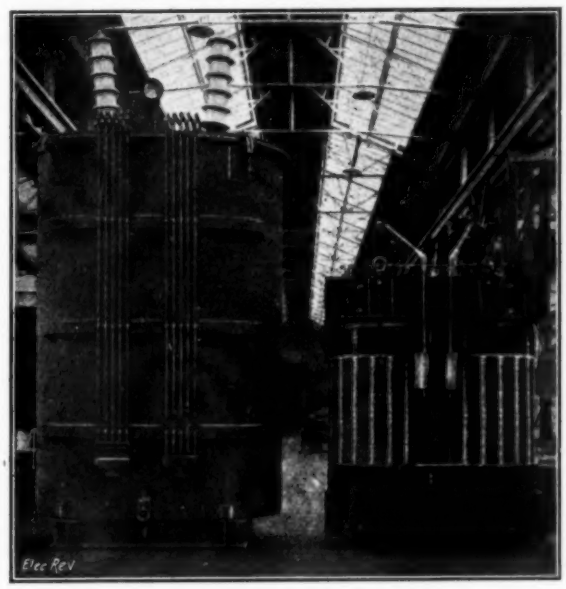

Fig. 3.—An "English Electric" 12,500-kVA 110,000/23,000-V Transformer.

internal cooling ducts throughout the magnetic circuit and the use of welded boiler-plate frames. The English Electric Co.'s "key bolt" construction has been adopted for the core; this eliminates all vertical tie bolts. The high-voltage bushings are of the condenser type and have porcelain shields to give the necessary creepage distance under wet conditions. They will easily withstand 555,000 V dry without flashing over, and 250,000 V under wet conditions. Other "English Electric" products exhibited are a 375-kW, 650-V, 1,500-r.p.m., 50-cycle rotary converter; an ironclad truck type switchboard and switch pillars; various standard a.c. and d.c. industrial motors, one of them a pipe ventilated machine with loose covers showing the method of conversion to the totally enclosed type; also a selection of small tools.

Sturge & Baker, Ltd.

This company is again showing its "Red Rose" fires, which are now made in five sizes, from 300 to 1,500 W. These are bowl fires with the element wires mounted upon a circular base. The design is varied in some new patterns exhibited, the element former being oblong in shape instead of circular. Another speciality of this firm is the flex absorber, and several different types and sizes are shown, the largest of which will support a weight of 10 lb. One pattern shown will take up to 120 ft. of flex.

The General Electric Co., Ltd.

It is the aim of the General Electric Co., Ltd., to show visitors the comprehensive nature of its productions. To this end each of the companies comprising this great organisation shows typical examples of its particular manufactures. The stand is 100 ft. long, and ovals upon the front of it indicate the various sections as well as the many oversea branches of the company imparting an idea of its widespread activities. The Witton Works is represented by heavy electrical engineering products, including generators, motors, switchgear and switchboards. One of these exhibits, a steel-works motor, is illustrated in fig. 4. Fraser & Chalmers Engineering

Works show a model of a turbine and various turbine components as well as a number of other mechanical engineering products. Salford Instruments, Ltd., exhibits measuring instruments, such as ammeters, voltmeters, insulating testing sets, inter-valve and telephone transformers, as well as Salford air circuit breakers, automatic time switches, &c. The Express Lift Co., Ltd., shows the complete gear for a lift installation at Messrs. Lewis's store, Birmingham, and other things connected with electric and hydraulic lifts. Samples of paper-insulated and v.i.r. cables are shown by the Pirelli-General Cable Works, Ltd. The Peel-Conner Telephone Works displays automatic and battery call telephones, including a 100-line section of an automatic exchange. "Gecophone" radio receiving sets also appear in this compartment. The Osram-

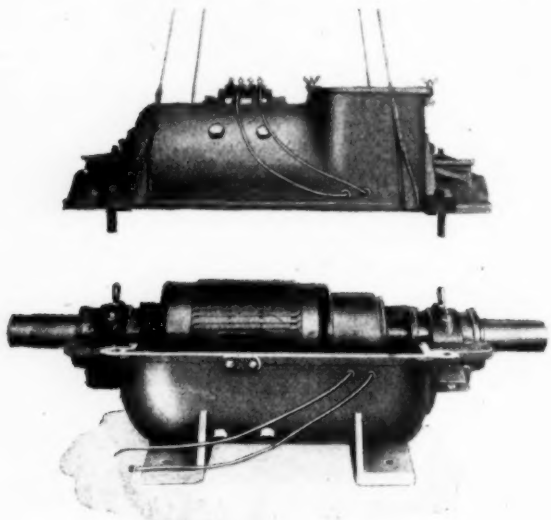

Fig. 4.—A G.E.C. Steel-works Motor.

G.E.C. Works shows examples of all types of lamps which it produces, as well as "Osram" valves in a variety of patterns for all reception and transmission purposes. A special section is devoted to "Magnet" appliances. Here there are electric lighting fittings of all types; British-made power-driven domestic electrical appliances, including refrigerators, clothes washers, dish washers, sewing machine equipment, drink mixers, egg whisks, vibrators, hair dryers, and vacuum cleaners. Electric heating and cooking are also well represented, as are the "Magnet" wiring system and installation accessories. Another part of the stand is devoted to "Freezor" fans of all types, including special patterns for tropical use. "Geekoduct" steel conduit and conduit fittings are shown in a novel manner.

The Castle Fuse and Engineering Co., Ltd.

This company exhibits a large number of "Triumph" fuses ranging from 5-A to 300-A capacity. The contacts used in this type of fuse are of the plug-and-socket pattern. The difficulty of non-alignment between the plugs and sockets has been overcome in a simple but effective manner; the plug is made considerably larger in diameter than the socket, so that it is too large to enter at all. The plug is then slotted by transverse longitudinal saw-cuts extending over the greater portion of its length; then it can be pushed in to enter the socket for some distance, but cannot be pushed right home. The socket itself is therefore slotted with similar longitudinal saw-cuts, and the plug can be pressed completely home in the socket, the pressure required being practically constant throughout the full length of the travel. The slotted end of the plug closes in as it approaches the bottom of the socket, while the top of the socket opens out as the slotted portion of the plug reaches it; thus, while both plug and socket each assume a form that is slightly conical, their relative surfaces are parallel and in intimate contact. The company is also showing various types and sizes of ironclad distribution boards, ranging from small double-pole 5-A boards in cast-iron cases, up to large 3-phase fuse assemblies of 300-A capacity in built-up steel cases with arc-proof and insulating lining. All the boxes are fitted with detachable end plates, which can be removed for drilling and during connecting up.

Credenda Conduits Co., Ltd.

The company's exhibit consists of the well-known "Creda" heating and cooking appliances. There is a range of electric cookers from a size suitable for providing for 18 persons down to a very small model to cater for two persons. The cookers are very well finished, and the chief features are the plug-in interchangeable elements; the oven interiors which can be removed in one piece for convenient cleaning; and the simplicity of the wiring, which is of bus-bar construction throughout. The company informs us that it is making great headway with these cookers, and has found it necessary to open a new factory covering an area of five acres to cope with the demand. A large number of electric fires are on view, representing a great variety of designs and finishes. These are fitted with the "Crater" fire bar. This is a 1-kW unit and has a steel back, which renders it practically unbreakable. The wire is so arranged that the bar gives an appearance of a glowing mass. Among the other domestic appliances shown are a number of electric kettles, most of which are fitted with a protector device which automatically cuts off the current should the kettle be allowed to boil dry. This device is fitted with an easily-renewable fuse. A 10-gallon electric wash boiler is exhibited, and other exhibits are fires, boiling rings, toasters, warming plates, &c., as well as samples of the tube and tube fittings made by the company.

The Relay Automatic Telephone Co., Ltd.

This company is providing the automatic telephone service for the administration at Castle Bromwich. It has a complete 50-line private automatic branch exchange equipped for 30 lines. This comprises an automatic switchboard, a power board, a manual section for using in connection with the public exchange calls, a 24-V accumulator battery and various types of telephones. The switchboard is built on the expanding book-case system; it consists of an iron frame into which relay groups are fitted in multiples of 10. The groups can be increased as required without interrupting the service. The only moving parts in the relay switchboard are small armatures, which have a maximum movement of 1/32 in. There are no electro-mechanical switches or other mechanical devices in the system which require constant adjustment, oiling, or cleaning. On the company's stand a "code calling" device is also installed. This apparatus is designed to enable anyone who is absent from his room and is wanted, to be located immediately. The system is an electrically-operated signal service, which sounds a call for the wanted person throughout the premises. The installation shown is capable of making 25 different calls; a motor generator supplies the ringing current.

Electricars, Ltd.

Two new designs of electric industrial trucks appear on this firm's stand. One is of the elevating platform pattern, and the other a small three-wheel runabout suitable for use in congested areas and along narrow gangways. The platform truck has a capacity of 2 tons, an overall length of 9 ft., and a width of 3 ft. The platform can be raised or lowered 4 in. Steering is applied to all four wheels. Only one motor is used; this drives by silent chains, through a selective dog clutch, either the running or elevating gear as required. The clutch is inter-connected with the controller and a "dead man" switch, so that the motor is automatically stopped on the completion of either raising or lowering the platform. The truck is propelled by an overhead worm-driven axle, and the power is transmitted to the driving wheels through bevel gears mounted on and around the stub axle swivel pins. The gears are totally enclosed and run in oil. The battery has a capacity of 225 Ah. The smaller truck is built to carry one ton. It is 7 ft. long and 2ft. 4 in. wide, and it has a 3-in. lift. The driving and steering are done through a single leading wheel of large diameter, into which the motor is built. The carcase of this may be said to form the hub spindle around which the wheel revolves, driven through suitable reduction gear by the revolving armature. The movement of the platform is operated by hand.

The Cable Accessories Co., Ltd.

This exhibit is divided into two sections, devoted to cooking and heating respectively. In the cooking section there is a comprehensive range of cookers in excellent finishes catering

Fig. 5.—The "Study" Fire.

for the requirements of families up to 10 persons. There are four models—the largest has a total loading of 7,250 W. It has a hot cupboard, a grill, and two large and one small boiling plates. The oven space is 16 in. wide, 16 in. deep, and 14½ in. high. The smallest type, the "Revo" bungalow cooker, has a total loading of 2,500 W, and is equipped with a single plate or grill. In this case the cooking space measures 12½ in. by 10 in. by 10 in. A special type of boiling plate is fitted to these appliances, known as the "Revotherm." This is a semi-enclosed plate embodying many new features. In it the advantages of the open-type plate have been retained and the disadvantages overcome by the introduction of enclosed plate principles. Efficiency is assured by long steatite insulators through which the heavy gauge resistance wire passes,

to make actual heat conducting contact with the grid shaped top plate. In the fire section there is a large assortment of radiators of distinctive design, most of which are fitted with the "Revo" "Emitter" fire bar. This component incorporates the parabolic reflector principle; the surface of the fireclay unilluminated by the radiant coil, is reduced to a minimum, doing away with the dark patches on the face of the bar when the fire is in operation. Heavy section, self-aligning plug-in contacts are provided to facilitate the changing of the fire bars. The general design of the "Emitter" bar is a bowed fireclay former of heavy cross section, traversed by five parallel troughs of parabolical form, the axis of each being tilted slightly upwards from the horizontal, projecting heat rays in the most useful direction. These troughs house the heavy resistor in correct focus. Support is obtained by means of integral webs of fireclay of minimum width, so that in effect the coil lies in a continuous trough and at correct focus at all points along its length. The life of the coil is lengthened by the low current density at which it is worked. A typical application of this fire bar is illustrated in fig. 5. This is the "Study" fire, in which two of the bars, *i.e.*, 2 kW, are fitted.

Petters, Ltd.

The main exhibits on this stand are a 16/20-b.h.p. twin cylinder marine engine and reverse gear, and a 12/14-b.h.p. stationary "S" type cold starting crude oil engine. The marine engine works on crude fuel oil and paraffin and has no magneto. It is a slow-speed medium-compression engine and is claimed to be very reliable and economical in fuel consumption. The stationary engine is also a surface ignition engine without magneto, and is made in sizes ranging from 5 to 36-b.h.p. A general purpose unit for use on farms or in smaller applications, is the 5-h.p. "Handyman" engine shown. An example of the company's "Petter Light" plant which is suitable for country house installations is shown; a substantial battery is provided with this set, and a switchboard possessing all the instruments necessary for the efficient operation of the plant by persons with no electrical knowledge.

"Manda" Motors, Ltd.

Small motors and their applications are displayed upon this stand. There is a range of these machines from 1/20th h.p. to ¼ h.p., d.c., series shunt and compound-wound, operating at any speed from 1,000 to 2,500 r.p.m. A number of new a.c. motors of a similar range, single and polyphase, high and low voltage, are also shown. An a.c. high-pressure rotary converter for radio use is another exhibit. This apparatus enables the h.p. battery to be charged without complicating circuits which are used for l.p. battery charging. The machine gives ½ A at 70 V. Several exhaust fans appears with from 10-in. to 48-in. blades. Other applications of small motors are an electric turntable and buffing, polishing and grinding machines. There is a collection of starting and regulating switches for use with these motors.

The Edison Swan Electric Co., Ltd.

This company has a varied collection of its many electrical products. Particular attention is devoted to "Royal Ediswan" lamps, and examples of all types, *e.g.*, carbon filament, vacuum, and gasfilled. The "Fullolite" lamp of opal glass with an inner protective skin of clear glass, is given prominence. Another interesting lamp made by the company is the "Pointolite," which has a bulb housing a tungsten arc. This lamp has many applications, including kinema projection work, and in laboratories where a point source of light is required. The company also has a large display of electrical accessories, including lampholders, switches, junction boxes, fuse boxes, distribution boards, &c. Another section is devoted to domestic electrical appliances, and here are shown the "Little Glutton" vacuum cleaner, irons, kettles, toasters, and other devices. A further part of the exhibit consists of a representative range of "Ediswan" radio valves.

Other Exhibitors.

In addition to the foregoing, which are only a few of the electrical firms, brief mention must be made of the following exhibits, and more space will be devoted to most of them in a later issue:—

Geo. Ellison (switchgear); The B.S.A. Radio, Ltd. (wireless apparatus); Reeves & Co. (electrical accessories); Imperial Engineering Co. (cooking, heating, &c., appliances); Mouldensite, Ltd. (moulding powders and impregnating varnishes); Veritys, Ltd. (motors, starters and lighting fittings); Coley & Swinnerton, Ltd. (cookers, wash boilers, &c.); Steam Fittings Co., Ltd. (valves, regulators, &c.); Blackstone & Co., Ltd. (oil engines); Vickers-Petters, Ltd. (heavy-oil engines); G. Turnock (cable connectors, charging boards, &c.); S. J. Daulby (d.c. motors); C. H. Parsons, Ltd. (switches and lampholders); Tangyes, Ltd. (oil engines and pumps); Commutator Grinding Block Co.; Lightfoot Refrigeration Co., Ltd. (ice-making and refrigerating machines); British Electrical Repairs, Ltd. (generator repairs, &c.); London Electric Wire Co. and Smiths, Ltd. (wires and cables); Julius Sax & Co., Ltd. (alarms, signalling apparatus, &c.); W. E. Burnand & Co. (electric motors and furnaces); W. & T. Avery, Ltd. (weighing, recording and testing machines); Automatic Electric Furnaces, Ltd.; Alfred Herbert, Ltd. (machine tools); Belling & Co. (cooking and heating apparatus); Rapid Magnetting Machine Co., Ltd. (electro-magnetic separators); National Time Recorder Co., Ltd. (recorders and costing machines); British Electric Transformer Co., Ltd. (cookers, fires, &c.); Higgs Motors (dynamos, motors and parts); J. H. Tucker & Co., Ltd. (electrical accessories); Tok Switches, Ltd. (snap switches and plugs); Jackson Electric Stove Co., Ltd. (heating and cooking apparatus); Magnetic Separators, Ltd.; Electric Heating & Hardware, Ltd. (electric fires and domestic appliances); the Arora Co. (electric fires); W. McGeoch & Co. (switch and fuse gear, signalling lamps, &c.); E. H. Millington & Co., Ltd. (lighting fittings); S. A. Lamplugh, Ltd. (radio apparatus); Smith & Paget (electric washing machines); Henry Watson and Sons, Ltd. (electric lawn mower); Eastern Telegraph Co., Ltd.; Holden & Hunt (electric welding plant); Allen-Liversidge, Ltd. (welders and riveters); Babcock & Wilcox, Ltd. (lighting sets); Bowen Instrument Co. (electrical pyrometers); Waygood-Otis, Ltd. (model lift); Sheringham Daylight Co.; Atomised Fuel & Engineering Co., Ltd.; Rustless Surf-Alloy, Ltd. (low-voltage furnace); Hackbridge Electric Construction Co., Ltd. (transformers); R.M.P., Ltd. (mica); the Electrolier Co. (lighting fittings); Spauldings, Ltd. (insulating materials); Record Electrical Co., Ltd. (instruments); Francis Lamplocks, Ltd.; Birkby's (synthetic resins); Dowsing Radiant Heat Co., Ltd. (heating, cooking, &c., appliances); Premier Electric Heaters, Ltd. (domestic appliances); Bulpitt and Sons, Ltd. (electrical utensils); Bastian Meter Co., Ltd. (geysers, meters, &c.); Berry's Electric, Ltd. (switchgear, fires, &c.); Gent & Co., Ltd. (radio apparatus, clocks, and signalling gear); Siemens & English Electric Lamp Co., Ltd. (lighting fittings and domestic appliances); Siluminite Insulator Co., Ltd.; National Gas Engine Co., Ltd. (crude-oil engines and generating sets); Crossley Bros., Ltd. (oil engines and a new lighting set); Young, Osmond & Young, Ltd. ("Lightfoot" heating system); A. W. Beuttell & Co., Ltd. ("Linolite" fittings); Hewittic Electric Co., Ltd. (mercury arc rectifier and "Service Light"); Ruston & Hornsby, Ltd. (cold-starting oil engines, &c.); "Ceag" Miners' Supply Co., Ltd. (miners' lamps); "M.K." Electric, Ltd. (plugs and sockets, switches, &c.); and K.F.M. Engineering Co., Ltd. ("Internalite" signs).

The London Fair.

The London Section of the Fair is housed in some of the buildings of the White City, Shepherd's Bush; it comprises many hundreds of firms, covering a wide range of classes, but the electrical industries are here represented mainly by wireless apparatus. The following firms are exhibiting:—Ashley Wireless Telephone Co., Ltd.; Beard & Fitch, Ltd.; Brandes, Ltd.; British Radio Corporation, Ltd., British Thomson-Houston Co., Ltd.; S. G. Brown, Ltd.; Burndept Wireless, Ltd.; J. J. Eastick & Sons; Elven Mains Receiver Co.; Finston Manufacturing Co., Ltd.; Formo Co.; General Electric Co., Ltd.; Gilfillan Bros., Ltd.; Halcyon Wireless Supply Co., Ltd.; Lisenin Wireless Co.; London and Provincial Radio Co.; Magonee Specialities, Ltd.; Marconiphone Co., Ltd.; Marconi's Wireless Telegraph Co., Ltd.; M. O. Valve Co., Ltd.; Mullard Wireless Service Co., Ltd.; North London Valve Co., Ltd.; Peerless Productions, Ltd.; Permec, Ltd.; Radio Communication Co., Ltd.; Read & Morris, Ltd.; Red Seal Loud-speakers; Sexton-Barnes, Ltd.; Stratton & Co., Ltd.; Telegraph Condenser Co.; Wates Bros. & Co., Ltd.; Watmel Wireless Co., Ltd.; Western Laboratories, Ltd.

General Electric Co., Ltd.

This company's exhibit (Stand No. C. 48), is in four sections —"Osram" valves, "Gecophone" wireless receiving sets, installation components and accessories, and "Witton" moulded insulation. Every type of the well-known "Osram" valve is shown, both receiving and transmitting, including the dull emitter types, to which the D.E.2 (h.f. and l.f.), have recently been added. The "Gecophone" section ranges from the "Junior" crystal set to the six- and eight-valve superheterodyne receiving sets, covering one, two, three, and four-valve sets. Amongst installation components and accessories are the "Gecophone" low-loss slow-motion variable condenser, the new "Gecophone" l.f. transformer, and the "Gecophone" universal filament rheostat.

Mullard Wireless Service Co., Ltd.

Over a dozen types of receiving valves are displayed by this company, including the P.M.3—a general-purpose valve—the P.M.4, P.M.6, D.F.A.6, D.F.A.7, D.F.A.8—dull-filament power amplifiers, which are recent additions. The dull-filament valves, P.M.3, P.M.4, and P.M.6, have filaments of extremely high emissivity, taking only 0.1 amp.; in the case of the P.M.3 and P.M.4, the filament is of "N" shape and is therefore said to be nearly equivalent to three valves in parallel. The P.M.6 possesses an "M" filament, equivalent to four valves in parallel. These features give rise to the high mutual conductance claimed for these valves. The company produces a large number of types of transmitting valve, ranging from 5 watts up to 30,000 watts. Amongst them there are some interesting additions. The D.0/40 is a dull emitter transmitter capable of handling a dissipation of 40 watts at the anode. Also the new D.F.A.6, D.F.A.7, and D.F.A.8 (offered as power valves for handling very large outputs) are efficient low-power dull emitter transmitters. The transmitting valves from 5 watts to 600 watts are in glass envelopes; above this power the envelopes are of silica. The 30-kW valve is of the water-cooled metal-glass type. Amongst the company's most recent productions is a wire-wound anode resistance made in standard values up to 100,000 ohms.

Legal.

Metropolitan Tunnel and Public Works, Ltd., v. London Electric Railway Co.

IN the Court of Appeal, before the Master of the Rolls and Lords Justices Scrutton and Sargant, on February 8th, this case was heard upon the appeal of the defendants from the refusal of Mr. Justice Lawrence in the Chancery Division to stay the proceedings in the action (commenced by originating summons, under Section 4 of the Arbitration Act, 1889). It appeared from the statement of Mr. C. E. Jenkins, K.C., for the appellants, that the matter arose under a contract between the parties entered into in May, 1924, for the execution of some tunnelling work by the plaintiffs for the defendants on the Charing Cross to Kennington extension. Counsel said the contract in question was what was known as a "schedule of prices" contract by which the contractors agreed to execute the work in question for about £395,000. The defendants had already paid to the plaintiffs about £270,000 on the certificates of the defendants' engineer, but a question arose with reference to the *interim* payments to the contractors by the defendants on the certificates of the engineer and the contractors' right to have recourse to what was referred to as the "general contingencies account" or fund in the contract. Counsel contended that Mr. Justice Lawrence had wrongly exercised his discretion in refusing to stay the proceedings under the arbitration clause in the contract. Mr. Owen Thompson, K.C., having supported the decision of Mr. Justice Lawrence on behalf of the contractors, their Lordships, by a majority (Lord Justice Sargant dissenting) allowed the appeal and stayed the proceedings, and the matter in dispute was therefore remitted to the arbitrator.

The defendants were awarded the costs of the Court below and of the appeal.

Traveller Sent to Prison.

WILLIAM THOMAS, 31, traveller and general dealer, of Walworth, found guilty of feloniously receiving 17 wireless valves and two sets of transformers, the property of Messrs. Pettigrew and Merriman, of Tooley Street, was sentenced at the London Sessions on February 9th to three months' imprisonment in the second division.—*The Times.*

Thefts of Radio Material.

AT Old Street Police Court, on Saturday, Cecil H. Quinton, warehouse foreman, pleaded guilty to a charge of stealing a l.f. transformer and a condenser, value 21s. 8d., the property of his employers, Messrs. Hobday, Limited, from a warehouse. The prosecution stated that a director of the firm went to defendant's address and found between £250 and £300 worth of radio components. They found at defendant's address a number of receipts for things he had purchased at Hobdays, but these receipts only covered a very small number of articles.

Defendant was, up till a few weeks ago, one of the men employed to search other employés. Holding that position he was not himself searched. Defendant said he had been driven into the position by force of circumstances. In his previous situation he had a number of assistants under him, and he had to show a surplus for the goods that he handled. For several years he was able to show a large surplus. His remuneration was £3 per week and a commission payable at the end of the year. Owing to shortage of stock to which everyone else had access, he was thrown out of employment, and was not paid his commission. Prisoner was sentenced to three months' imprisonment, with hard labour.

Theft of Electricity.

AT the Cardiff Police Court, on February 11th, George F. Cooksley, managing director of G. F. Cooksley & Co., Ltd., electrical engineers, Cardiff, was charged with the fraudulent abstraction of electricity, valued at £1 7s. 3d., from the Corporation's mains. For the prosecution it was stated that the defendant took a room which was not equipped with electric lighting. He then engaged an electrician to make a connection to the lighting mains under the floor of the office. The energy thus obtained was used for lighting and later for heating, and was charged to the principal occupant of the premises. Defendant pleaded guilty, and the magistrates imposed a fine of £10, or, in default, two months' imprisonment.

Southport Corporation v. Birkdale District Electric Supply Co., Ltd.

LORDS Birkenhead, Atkinson, Sumner, Wrenbury, and Carson, on February 12th, delivered judgment in the House of Lords in this case, it being an appeal from a judgment of the Court of Appeal reversing a judgment of Mr. Justice Astbury upon a question of charges for electricity supply.

The Birkdale Company supplies electricity in the old Birkdale urban district, now included within the Borough of Southport, and the Corporation of the latter town objecting to the company's charging a higher price within its area of supply than the Corporation did in its own area, brought an action with a view to restraining it from doing so. Mr. Justice Astbury dismissed the action, but the judges in the Court of Appeal, in reversing his decision, granted an injunction restraining the company from charging more, so the company appealed to the House of Lords, asking that Mr. Justice Astbury's finding might be restored. Their lordships unanimously dismissed the appeal.

LORD BIRKENHEAD said the appellants relied strongly on a well-established principle of law, that if a person or public body was entrusted by the Legislature with certain powers and duties expressly or implicitly, for public purposes, those persons or bodies could not divest themselves of these powers and duties. They could not enter into any contract or take any action incompatible with the due exercise of their powers or the discharge of their duties. In none of the authorities cited was this principle questioned. The problem was throughout, on the facts proved, to bring the case within the principle.

The case of the York Corporation *v.* Leatham was somewhat severely criticised in the Court of Appeal. The facts of it were peculiar, and having regard to this peculiarity he regarded that case as distinguishable.

LORD WRENSBURY pointed out that in the York case there was a contract between those who controlled the statutory undertaking and a third party as to the price to be charged, but there was no such contract here, the contract being only between the District Council and the company which was taking a transfer of the undertaking. Lords Atkinson, Sumner and Carson concurred, and the appeal was dismissed.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Electrical Commercial Travellers.—The Electrical Trades Commercial Travellers' Association, which was formed about a year ago, held its first annual dinner, at the Manchester Hotel, London, E.C., on Saturday evening last. Mr. C. W. Sully was the chief guest, and Mr. E. A. Joyce occupied the chair. There were many toasts, including "The President and Vice-Presidents," proposed by Mr. A. S. Markes, and responded to by Mr. Sully and Mr. V. Dale. "The E.T.C.T.A. and Chairman" was proposed by Mr. Sully, and responded to by Mr. Joyce. Mr. Sully said that the Association had already done a good deal of useful work. When they came together at meetings like that, they got all the advantages of co-operation and understood the individual points of view of each other. He congratulated them upon the success of their first year's work, and referred to the social and educational advantages of associated activity. Mr. Joyce, in replying, said that they intended to make the Association a power in their daily work; there was no limit to the benefits that they could secure. They had made a start with their Employment Register. It was within their possibilities to be able to advise companies with regard to members' agreements. They would welcome recruits, and he threw out a hint in favour of fraternising with other societies. Other toasts were "The Charities," "The Visitors," and "The Officers." The toast, "The Press," was proposed by Mr. L. Moir, one of the Press secretaries, who thanked the Press for the assistance that it had given the Association since its inauguration, and coupled with the toast the name of Mr. A. H. Bridge (Commercial Editor of the ELECTRICAL REVIEW). Mr. Bridge, in responding, congratulated the Association on the success that had attended its operations down to date, and said that it should occupy an increasingly important place among electrical associations as its membership grew. He said that they must not imagine that editors were always writing. Nowadays they spent much of their time talking, and in his case during nearly 35 years in the editorial chair he had had to listen to the troubles of large numbers of electrical travellers. This being so, he was impressed not only with their difficulties, but with the great value which such an association might be to members if it became a large organisation. He had witnessed the birth of most of the electrical organisations, excepting the Institution of Electrical Engineers. Some had died, others had become a great power in the land, and while organisations filling different purposes were not comparable, he thought that there was a place for their body to become a real power for the commercial man. In his pre-journalistic days he had been closely connected with the commercial engineering trade, and had to do with the sending of travellers to South America. In those days orders were as easy to pick up as stones and sand. To-day things were very different. If they looked round the electrical industry they would see men practically at the top who 30 years ago began life as commercial electrical travellers. That circumstance should give encouragement to those present in considering the wonderful future that lay before our electrical industry. The speaker went on to

some of the problems that had been put to him from time to time—troubles between commercial travellers, between travellers and their employers, requests for advice as to whether under stated circumstances it was worth while going to law, whether such and such a salary offered for a post advertised in the ELECTRICAL REVIEW would be sufficient if they went to take up a job at Timbuctoo, Salt Lake City, or Jericho; whether it was safe to go without an agreement; whether there were risks of being landed in India out of a job and without means of getting home. These were typical questions upon which they could centre their thoughts as an association. Communications should be addressed to the Hon. Secretary, Mr. R. F. Norris, 25, Hamlet Gardens, Ravenscourt Park, W.6. The subscription is only 10s. 6d. per annum, this low figure being made possible by the fact that all officers have been rendering devoted voluntary service.

Electricity at the Ideal Home Exhibition.—Messrs. L. G. HAWKINS & CO., LTD., inform us that they have again secured the favourable position which they held in past Ideal Home Exhibitions. One of the features of their stand will be a model electric kitchen in which special demonstrations will be given by Alderman Mrs. Hammer and Mrs. Pearmain, of Hackney. There will also be a good show of lighting fittings and domestic appliances.

Admiralty Electrical Engineers' Pay.—An award of the Industrial Court was issued last week on the salary scales of electrical engineers employed by the Admiralty at headquarters, at the Royal Dockyards, and elsewhere. The Court fixed the following basic salaries—*i.e.*, salaries exclusive of cost of living bonus:—

Assistant electrical engineer—£310 a year, rising by annual increments of £15 to £475; electrical engineer—£475, rising by £25 to £650; senior electrical engineer—£575, rising by £25 to £725. Electrical engineers appointed as senior electrical engineers will enter the higher scale at their existing salaries or at the minimum of the scale, whichever is the greater. Engineers and senior electrical engineers will continue to be provided with a house or house allowance, and the special allowance of £75 a year to senior electrical engineers will be discontinued.—*The Times.*

Co-ordination of Overseas Propaganda.—In a recent letter to the Prime Minister the Federation of British Industries points to the necessity of co-ordinating propaganda for British interests in oversea countries. So far, it is said, every question has been dealt with separately by a separate body, and it is thought that this divided effort should give place to a more effective method. The F.B.I. therefore suggests the appointment of an inter-departmental Government Committee upon which representatives of industry, commerce, finance, shipping, science, arts, education, and other interests should be invited to serve with a view to co-ordinating British propaganda abroad.

Social Events.—The annual dinner of the staff of the Torquay Electrical Department was held on February 6th. The toast of "The Undertaking" was proposed by Mr. H. F. G. Woods, the borough electrical engineer, who referred to the progress made during the past year, particularly with regard to domestic consumers. A musical programme followed the dinner and toasts.

The first annual dance and social of Preston Corporation Electricity Department Sports and Social Club took place on February 10th, over 900 persons attending, including the president, Mr. W. S. Wood (Ribble power station superintendent) and members of the Corporation.

About 120 members and friends gathered to celebrate the first social evening arranged by the Sheffield Illumination Society, held at Stephenson's Restaurant, Sheffield, on the 9th instant, when Councillor W. Melling (chairman of the Lighting Committee) presided. Councillors M. Humberstone, J.P., and S. Warren were also present. Councillor Melling made reference to the greatly improved street lighting of the city since the appointment of a public lighting engineer, and said that Sheffield had been further honoured by Mr. J. F. Colquhoun (public lighting engineer) being asked to deliver a paper at the Conference of the Institution of Public Lighting Engineers, to be held at Newcastle in September next. Whist was followed by musical items and after supper the musical programme was continued.

The annual staff dance of the Paisley Corporation Electricity Department was held on February 5th at the Town Hall. The function took the form of a whist drive and dance, and, at the conclusion of the whist drive, domestic electrical appliances were presented to the winners. The chief electrical engineer and his wife (Mr. and Mrs. Blair Smith) were present, and representatives of a number of local electrical firms also attended.

The Hackbridge Cable Co.'s Sports Club is holding its annual dinner at the White Hart Hotel, Mitcham, on March 13th.

Local Exhibitions.—ENNISKERRY (Co. WICKLOW).—Under the auspices of the Enniskerry Electric Supply Co-operative Society, an exhibition of electrical appliances was held recently in the Carnegie Library and the show was largely attended. Mr. S. P. O'Byrne gave a demonstration and a lecture on the utility and economy of electrical domestic appliances.

BACUP.—At the Mechanics' Hall, Bacup, on February 12th, a week's exhibition was opened by the chairman of the Corporation Electricity Committee, the Mayor (Alderman H. Whitehead) presiding over a large attendance. All kinds of electrical appliances are shown for cooking, lighting, washing, heating, &c., and an electric café and lounge have been installed.

The Amendment of the Bankruptcy Law.—It is reported that the Board of Trade hopes to deal during the present session of Parliament with the law of bankruptcy by the introduction of a Bill based on the report of the Departmental Committee issued last year. In the main the recommendations of the Committee have been accepted. It is proposed that acts committed within twelve months of the presentation of a petition may be made criminal offences, instead of within six months as at present. The books that must be kept will include accounts of all goods sold and bought and sufficient details of the goods and their buyers and sellers to enable them to be identifiable. The Committee also suggested that courts of summary jurisdiction should have power to inflict up to twelve months' imprisonment for a bankruptcy offence, instead of six months as at present, and that in certain cases the maximum punishment should be increased to five years' penal servitude.

Lead.—Reporting on February 13th, Messrs. James Forster & Co. state:—"A little better demand from consumers has been experienced this week, though it still leaves much to be desired. Prompt supplies are still plentiful, but arrivals during the next few weeks are expected to be on the light side. . . . It may be that before long we shall have to absorb surplus American lead, as well as the bulk of the Mexican output. The Board of Trade returns for January show:—Imports, 26,898 tons; exports, 2,355 tons; leaving for home consumption 24,543 tons."

The International 48-hour Week.—Last week a meeting of the Executive Committee of the International Metal Workers' Federation was held in Prague. Mr. J. T. Brownlie, the English representative, moved a resolution expressing satisfaction at the action of the British Minister of Labour in inviting representatives of Continental Governments to a conference upon the institution of the 48-hour week in the engineering industries of those countries, and urging all organisations connected with the Federation to bring all possible pressure to bear upon their Governments to give effect to the Washington Convention recommendations. The Federation, which represents nearly 5,000,000 European metal workers, adopted the resolution.

Engineering Employés' Wages.—In commenting upon the refusal of the employers in the engineering industry to concede the union's request for an increase of 2ds. per week in the wages of their members, the *A.E.U. Monthly Journal* (February) says:—"We suggest to Sir Allan Smith and his colleagues that they have not met the claim of their workpeople in the spirit in which their proposals to reduce wages were received in 1921. At that time, we were asked to accept cuts in wages, hitherto unprecedented, in order to assist the employers to bring about revival in the industry, and whilst never agreeing that reducing wages would bring about what the employers desired in the way of improved trade, nevertheless our members accepted the cuts and have continued to make the heavy sacrifices imposed upon them. We firmly believe that the engineering industry generally is in a position to meet an advance of wages to the men engaged therein. If employers hold the view that their employés are to wait until every section of the industry is in a flourishing condition before an increase can be granted, then they are wrong, and signs are not wanting that the patience of our members is at last giving way. During the past month, disputes of no small dimensions have taken place in London and other parts of the country—disputes which we submit would never have taken place had it not been for the feeling which is existing that we are not having a fair deal."

E.D.A. Conferences.—The subject of the E.D.A. Conference which is to be held at Caxton Hall this evening (Friday) is "The Electrical Industry and the Architect," and an architect (Mr. G. Blair Imrie, of Messrs. Imrie & Angell) will deal with the matter authoritatively. The next conference, which was to be held on March 19th, has been postponed until March 26th.

Bakers' Exhibition at Birmingham.—The Lord Mayor of Birmingham opened the annual Bakers', &c., Exhibition at Bingley Hall, Birmingham, on February 9th, and it remained open until February 18th. The exhibition was noteworthy for the amount of electrical equipment on view. The Artofex Engineering Works, Ltd., displayed an all-electric equipment, making and baking various foods as required for the modern confectioner. This comprised a three-deck sectional portable type electric oven, with proofer and steam generator; mixing and kneading machines, and a 4-speed "Express" cake mixer. The General Electric Co., Ltd., exhibited an electric baking oven, a portable and self-contained appliance designed to secure ease of operation and continuous working. A good deal of electrical equipment, as used in the bakery, was shown by the Hobart Manufacturing Co., Ltd. Messrs. Alfred Hunt, Ltd., exhibited portable ovens fitted with electric light in the baking chambers. Russell & Co. displayed several whisking machines, a mixer, with motor drive, &c. Electrical advertising signs were shown by the Roto-Sign Co., Ltd., and electrically-heated toasters, grillers, and steamers and poachers, were exhibited by Messrs. W. M. Still & Sons, Ltd., and the "Finnell" system of electric scrubbing was demonstrated by Messrs. W. Robert Wright, Ltd.

American Loan for Italian Electrical Enterprises.—It is understood that arrangements have been virtually concluded with a group of American bankers for the issue of a loan of $20,000,000 to the Italian Credit Institute for the development of hydro-electric enterprises in Italy. The bonds will probably bear interest at a rate of 7 per cent.—*Reuter* (New York).

Unemployment.—There was a further reduction of 25,827 in the number of registered unemployed during the week ended February 1st, the total at that date being 1,175,000. As compared with the corresponding date of last year there was a decrease of over 63,000.

Trade Announcements.—THE ELECTRIC WIRING AND REPAIR Co. has opened a new showroom and offices at 5, Corn Exchange Street, Cambridge. Manufacturers are asked to send new lists to that address.

MR. ALAN WRIGHT, Sentinel House, Southampton Row, London, W.C.1, has been appointed sole sales representative for Great Britain and Ireland for the radio products of the Hart and Hegeman Manufacturing Co., of Hartford, Conn., U.S.A. A 24-page illustrated price list has been received.

MESSRS. CROSLAND & BATESON, electrical engineers, have opened showrooms and works at 15, Cemetery Road, Heckmondwike.

MR. L. G. WALKER informs us that he is organising a contracting business under the title "West Wales Electric, Ltd.," at 3, High Street, Criccieth. He asks for lists and particulars from manufacturers.

The ATHOL ENGINEERING Co., of Higher Broughton, has acquired new works at Seymour Road, Crumpsall, Manchester, where it will have a greatly increased output of radio components.

Owing to the re-organisation of affairs in this country, Mr. F. W. LOWENADLER has resigned his connection with Messrs. Trelleborg Ebonite Works, Ltd. Pending completion of arrangements communications should be addressed to the company at Audrey House, Ely Place, London, E.C.1.

MR. A. MORETON SCALES, late manager of Kye, Ltd., has entered into partnership with Mr. W. R. Preston, and is carrying on a wholesale electric lamp trade, under the title of Lunar Electrical Co., at Sicilian House, Southampton Row, W.C.1.

The LANCASHIRE DYNAMO & MOTOR Co., LTD., announces that Mr. G. E. Whitehead does not now act as its agent in South Wales, and that it will shortly be opening an office in Cardiff to deal with both Lancashire and Crypto machinery.

The address of the Croydon Borough Electricity Department is now: Electric House, 38, High Street, Croydon.

MESSRS. G. S. PECKHAM & Co., of 4 and 5, New Compton Street, London, W.C.2, have been appointed London agents for Messrs. Cox-Walkers, Ltd., Darlington.

With reference to the announcement in our issue of February 5th of the death of Mr. E. B. TURNER, of Turner Bros., 134, Upper Thames Street, E.C., we are asked to state that the continuity of the business will be in no way interfered with. Mr. S. W. H. Turner is the new principal.

Catalogues and Lists.—ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—February stock list of dynamos and motors.

MESSRS. ROYLES, LTD., Irlam, near Manchester.—Illustrated pamphlets dealing with liquid strainers, air-heating plant, calorifiers, bath-water heaters, steam traps, &c.

MESSRS. F. GILMAN (B.S.T.), LTD., Grange Works, Grange Road, Smethwick.—Illustrated catalogue of "Skatoskalo" electric and other scaling tools for boiler and ship work.

MATERIEL ELECTRIQUE ALEX LEFEBVRE (EXPORT DEPT.), 9, Rue Arsène Houssaye, Paris.—A stock list of generating sets, motors, and other electrical plant.

THE GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2.—Folder B.C. 3991, containing details, illustrations, and prices of "Gecophone" radio components and accessories.

SIEMENS AND ENGLISH ELECTRIC LAMP Co., LTD., 38-39, Upper Thames Street, E.C.4.—A well-illustrated catalogue containing prices and details of "Siemens-Xcel" domestic electrical appliances.

SUPERLAMP, LTD., 92-94, Paul Street, Great Eastern Street, E.C.2.—Net trade price lists of electrical and radio materials and accessories.

MESSRS. CROMPTON & Co., LTD., Chelmsford.—Leaflets No. 761, describing the "Unique" cell-testing voltmeter, and No. 762, dealing with the "Alltest" multi-range portable moving coil instrument.

THE CONSOLIDATED PNEUMATIC TOOL Co., LTD., 170, Piccadilly, W.1.—A series of illustrated pamphlets:—S.P. 109, Portable air compressors; S.P. 110, Electric arc welding; S.P. 111, "Little Giant" combination hoist; and S.P. 112, Vertical power-driven air compressors.

MESSRS. FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue No. 565, illustrating and describing enclosed lighting units and "Holdrite" suspension sets. Priced.

MR. JOHN CASHMORE, Great Bridge, Staffs.—A catalogue of machinery and plant in stock, including electric motors, boilers, pumps, machine tools, &c.

MESSRS. FERRANTI, LTD., Hollinwood, Lancashire.—Pamphlet Ta159/1, illustrating and describing a 450,000-V testing equipment for a cable factory.

THE ENGLISH ELECTRIC Co., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 364A, describing the company's asynchronous synchronous motors. The booklet also deals with applications of these machines.

Bankruptcy Proceedings.—J. R. BARKER, Fanshelf House, Front Street, Pontefract, and 183, Kirkgate, Wakefield, late Gillygate, Pontefract, wireless dealer.—The receiving order in this matter was made on January 11th on debtor's own petition. The liabilities are returned at £221, and there is a deficiency of £129. The first meeting of the creditors was held on January 25th, at the Official Receiver's office, 21, King Street, Wakefield, when the case being a summary one, was left with the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Albion Electric Stores	24	Carter, R., & Co. (Bradford), Ltd.	21
The British Wireless Supply Co. (1924), Ltd.	38		

The public examination was held on February 11th at the Court House, Wakefield. Debtor attributed his failure to lack of capital, bad trade due to general depression, and loss through a workman. He commenced business at Gillygate, Pontefract, two years ago with £4 capital. He stated that wiring done by a casual workman whom he employed had been condemned and the job was a total loss. The examination was closed.

W. J. AYLING, 2, Rosemont Villas, Ballards Lane, North Finchley, electrical engineer.—The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £1,052, against assets of £7, leaving a deficiency of £1,045. Debtor attributed his failure to being unable to obtain money owing to him by a limited company. In 1900 he commenced business as an electrical engineer at Carlton Road, New Southgate, with £40 savings, and subsequently occupied premises in turn at Friern Barnet, Crawford Street, Tally-Ho Corner, Poland Street, and High Street, Edgware. In July, 1920, he paid his creditors a composition of 7s. 6d. in the £ on liabilities of £90. In March, 1923, he removed to High Street, Edgware. On November 10th, 1924, he promoted a private limited company, to whom he transferred his business for a consideration of £1,000 payable as to £250 in cash, £250 in fully paid £1 preference shares, and £500 in 2,000 fully paid 5s. ordinary shares, the company taking over his liabilities except a debt of £300 for money borrowed. He was appointed managing director of the company, and spent the greater portion of the £250 he received in cash in meeting claims for wages and materials on behalf of the company. He states that there is now £394 due to him which he regards as irrecoverable. The company is still carrying on business, but he states that the shares are of no value. He became aware of his position in March, 1925. The following are creditors:—

	£		£
Branchli, C.	200	St. Helens Cable & Rubber Co., Ltd.	20
Griffiths, W.	90	Ayling, A.	20
Beaumont, W. (Exors. of) ...	85	McConnell, W. J.	330
Nicholls & Clarke	65	North, D. T.	20
Abrahams & Co.	40	Wagner, C. W.	20
Pearce, W. J.	35		

N. A. LUDWIN, trading as N. A. LUDWIN & Co., Merchants, 122, Bunhill Row, E.C. The public examination of this debtor was held on February 15th, before Mr. Registrar Francke, at the London Bankruptcy Court, the accounts showing total liabilities of £10,850 (unsecured £8,690), and net assets valued at £1,382. In the course of his evidence, the debtor stated that he had dealt chiefly in hardware and radio goods; he had also acted as managing director of various companies carrying on similar businesses. In September last he was convicted at the Central Criminal Court upon charges of conspiracy and obtaining goods by false pretences, and was sentenced to six months' imprisonment in the second division. Witness attributed his insolvency to depreciation in the value of German currency, to loss of goods removed from store without his authority, and to loss of goods confiscated by the Customs authorities. The examination was concluded.

P. W. HORNE, radio dealer, trading as Horne Bros., Borough Road East, Middlesbrough.—This bankrupt underwent his examination at the Middlesbrough Bankruptcy Court on February 12th. His gross liabilities were £4,028, of which £3,807 was expected to rank for dividend. His assets were put at £254, leaving a deficiency of £3,552.

Debtor admitted that he knew very little about the business, but his brother, who was an experienced electrical engineer, had a shop, and gave him the opportunity of taking it over. He denied that his brother was a partner in the business despite the title of the firm. The title was his brother's suggestion. He removed to more suitable premises at a cost of £300, which money he borrowed from relatives. He continued in business because he hoped the wholesale part of the trade in the town, which was keeping the retailer from selling, would ultimately finish. The trade generally were up against a particular wholesaler, and trying to put him out of business.

The Official Receiver suggested that the debtor had come very largely to his present position by spending too much. The examination was adjourned to March 5th.

W. R. GRIGSBY (Wenham Lighting Corporation), electrical factor, 184, Grays Inn Road, W.C.—Last day for proofs for dividend, February 23rd. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1.

H. HALL, wireless dealer, 26, Egerton Street, and late of 6, Market Place and Albert Chambers, Radcliffe, Lancaster.—First meeting, February 19th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, March 16th, at the Court House, Bolton.

J. F. CARR, electrical goods agent, 89, Aston Avenue, Fallowfield, Manchester.—First meeting, February 16th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination March 12th, at the Court House, Manchester.

F. H. ARMITAGE, electrical engineer, 9, Occupation Lane, Pudsey.—Receiving order made February 4th, on creditor's petition. First meeting, February 19th, at the Official Receiver's offices, 12, Duke Street, Bradford. Public examination, March 8th, at the County Court, Bradford.

C. F. WADE, consulting engineer, 2, Cambridge Arcade, Pinstone Street, Sheffield.—First meeting, February 17th, at the Official Receiver's offices, Figtree Lane, Sheffield. Public examination, February 25th, at the County Court, Sheffield.

C. G. HOFMAN (W. J. Chambers & Co.), wireless components manufacturer and electrical engineer, Andrew Works, Calthorpe Road, Wandsworth Road, and 7a, Victoria House, South Lambeth Road, S.E.—Application for discharge to be heard at Carey Street, W.C., on March 5th.

G. J. C. THORNE and A. H. THORNE (Lawrence Trading Co.), electrical engineers, 51, Avondale Square, S.E.1, late of 159, High Street, Notting Hill Gate, W.—First and final dividend of 4¼d. in the £, payable at Carey Street, W.C.

A. H. MONCRIEFF, wireless manufacturer, late of 197, Anerley Road, S.E., and 60, Thornton Road, Bradford.—First and final dividend of 1s. 2d. in the £, payable February 20th, at the Official Receiver's office, 12, Duke Street, Bradford.

W. P. YOUNG (W. P. Young & Co., and Leicester Tanning Machinery Co.), mechanical and electrical engineer, 172, Kimberley Road, and 40 and 42, Sanvey Gate, Leicester.—Supplemental dividend of 2¼d. in the £, payable February 23rd, at the Official Receiver's office, 1, Berridge Street, Leicester.

Company Liquidations.—RE-ECHO RADIO CO., LTD., 109, Marsham Street, Horseferry Road, S.W.1, manufacturers of receiving sets and accessories.—A meeting of creditors was held on February 10th, at the offices of Mr. C. H. Whatley, Duke Street, W.C., the liquidator appointed in the voluntary liquidation of the company. A statement of affairs was presented which showed liabilities of £911, all due to unsecured creditors. There were debentures for £900, and there was also a contingent liability of £124, claimed by Marconi's Wireless Telegraph Co., Ltd., for royalties, which was at present in dispute. The net assets were £604, leaving an estimated deficiency of £307. The company was registered in September, 1924, being a reconstruction of the Re-Echo Manufacturing Co., Ltd., which was wound up by the Court. The new company purchased the assets of the old company from the receiver. The capital of the present company was £2,500. It appeared from the books that a very fair business was done up to March, 1925, but from April last until January of this year trade had fallen off considerably. The present position was attributed to insufficient capital, heavy overhead charges, and the slump in trade. It was hoped that the business could be sold as a going concern, and if that was done sufficient would be obtained to pay the creditors in full. Mr. Whatley stated that if the liquidation was continued with the present liquidator the debenture holder would fall in with the general body of creditors and rank as unsecured. After some further discussion it was decided that the shareholders of the company should be requested to pass resolutions appointing Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby & Hawkins, accountants and auditors, 4, Charterhouse Square, E.C., as joint liquidator with Mr. Whatley, together with a committee of inspection of three of the largest creditors. The following are creditors:—

	£		£
Marconi's Wireless Telegraph Co., Ltd.	254	Cobalt Magnet Steel Co., Ltd.	38
Universal Cabinets, Ltd. ...	101	Kent Bros. Electric Wire Co. and E. H. Phillips, Ltd. ...	38
Odhams Press, Ltd.	73	International Electric Co., Ltd.	30
Coan, Robert W., Ltd.	63	Thompson & Norris Mfg. Co., Ltd.	21
Fry's Metal Foundries, Ltd. ...	57		
Lowenadler, F. W.	52		

THE VAUXHALL CHEMICAL CO., LTD., 161a, Upper Kennington Lane, S.E.—Under a compulsory winding up order against this company, the business of which was to place on the market a chemical compound for the charging of batteries, the statutory first meetings of the creditors and shareholders were held on February 11th at Carey Street, W.C. The accounts showed liabilities of £2,056 against assets valued at £412, and a total deficiency of £2,644 with regard to contributories. The Official Receiver remains in charge of the liquidation.

VICTORIA ELECTRICAL (MANCHESTER), LTD.—Winding up voluntarily. Liquidator, Mr. R. N. Brookes, 6, Princess Street, Manchester.—A meeting of creditors was called for February 18th, at Victoria Works, Altrincham. Particulars of claims to be sent to the liquidator by March 1st.

Dissolutions of Partnership.—ERIC JOHNSON & Co., general electrical and mechanical engineers, 134, Old Street, Ashton-under-Lyne.—Mr. J. W. Webster and Mr. E. Johnson have dissolved partnership. Mr. Webster will attend to debts.

LAIRD, HYDE & HYAM, electrical engineers, Hill Cross, Coventry.—Messrs. G. A. Laird, D. Hyde, and T. H. Hyam have dissolved partnership. Messrs. Laird and Hyde will attend to debts and continue the business.

BLAXLEY CABLES, electrical engineers, 230, High Street, Erdington, Birmingham.—Mr. E. E. Peace and Mr. F. H. Blaxley have dissolved partnership.

B. C. BULLARD & Co., electrical engineers, 13, Museum Street, Ipswich.—Mr. B. C. Bullard and Mr. C. W. Tozer, Junr., have dissolved partnership. Mr. Bullard will attend to debts and continue the business under the same style.

J. K. COTTON & Co., electrical engineers, 2, Water Street, Rochdale.—Messrs. F. W. Brierley, J. Sugden and A. D. Wickham have dissolved partnership. Debts will be attended to by Messrs. Brierley and Sugden, who will continue the business.

HODDINOTT & Co., electrical factors, 19, Cannon Street, Manchester.—Messrs. H. Hoddinott, A. Dale and G. E. Bayley have dissolved partnership. Messrs. Dale and Bayley will attend to debts.

Book Notices.—"What's Wanted and Advice to Inventors" (1st Edition).—A useful booklet issued by the Institute of Patentees (Inc.), price 7½d. post free, containing many suggestions for the guidance of prospective inventors. A few short articles, including "Patents and the Income Tax," by S. E. Denning, F.I.S.A., and "The Legal Aspect of Patents," by Kenneth E. Bartlett, add to the interest of the publication. The aims and objects of the Institute are also given in detail.

"The *Electrician* Electrical Trades Directory and Handbook." (Pp. civ + 1,417.) London: Benn Bros., Ltd. Price, 25s. net.—This is the 44th edition of this useful directory. The usual features appear, having been brought up to date.

"Art and Commerce." Winning essays in *The Studio* international prize competition; together with an article on "The Organisation of Commercial Art in the United States," by Harry L. Sparks. (8 pp.) London: *The Studio*, Ltd.

"The *Journal* and Record of Transactions of the Junior Institution of Engineers." Vol. XXXVI, Part V, February, 1926. Price, 2s.

"Technologic Papers of the U.S.A. Bureau of Standards." Vol. 19, Nos. 298 and 299, October, 1925 (10 and 20 cents respectively).

"Circular of the U.S.A. Bureau of Standards." No. 1, October, 1925.

"The *Journal* of the Institute of Transport." Vol. 7, No. 4, February, 1926. Price, 2s. 6d.

"The Annual Report and *Transactions* for the 41st session, 1924-1925, of the Derby Society of Engineers."—The Society has now a membership of 225.

"The *Journal* of The Royal Technical College," No. 2, December, 1925. Price, 10s. 6d.

"The Transactions of the South African Institute of Electrical Engineers." Vol. XVI, Part 11. December, 1925. Price, 2s.

"Notes on the Induction Motor," by H. E. Dance. Pp. viii + 152; figs. 70. London: Oxford University Press. Price, 6s. net.

"Who's Who in Architecture (1926)." London: The Architectural Press. Price, 25s. net.

"The National Significance of Electricity." London: British Electrical and Allied Manufacturers' Association (Inc.).—A brochure reprinting four articles which have appeared in the financial Press, dealing respectively with the electrical industry, the national supply of electricity, the Government's electricity schemes, and standardisation.

The Timber Market.—Our Timber Trade Correspondent reports that the wood market for softwoods from the North of Europe, for general construction purposes, is fairly steady, but the country is holding heavy stocks. This latter position is set off to some extent by the better consumption which, it is expected, will improve still further in the early future. Competition on the spot is rather keen. In hardwoods the teak market continues very firm, with stocks light and a paucity of shipments to come forward. Of mahogany logs, those of prime quality and good size are firm in value, but for inferior grades the market has weakened a little. Mahogany planks and boards are highly valued. In other choice hardwoods, such as satinwood, ebony, rosewood, &c., the market is firm. For American oak, ash, walnut, and other woods, the market is steady, due largely to the high ideas of shippers for forward business. Stocks, generally, of States hardwoods are large, and the demand only moderate.

Early Church Lighting.—Messrs. Falk, Stadelmann and Co., Ltd., have been informed by one of their customers that he has recently re-wired Blockley Parish Church, Worcestershire, with the company's "Hitest" lead-covered cable on the "Esyway" system. The customer states that the church was the first in this country to be wired for electric lighting.

New Italian Companies.—Among the new concerns recently formed in connection with the electrical engineering industry in Italy are the Società Industria e Applicazioni Elettriche, Milan, capital 10,000 lire; the Società Astese Filovie Elettriche, Asti, capital 10,000 lire; and the Società Industrie Elettriche, Carolei (Cosenza), capital 600,000 lire.

Hackney: A Contractor's Protest.—The borough electrical engineer of Hackney (Mr. Robinson) recently invited the Hackney and Stoke Newington Chamber of Trade to compete for prizes offered for the best window-dressing displays in the four show-cases in the Electricity Demonstration Halls. An electrical contracting member of the Chamber was invited to take part, but at the last meeting a letter was read in which he resigned his membership as a protest against the action of the Chamber in working with the Borough Council instead of protecting the interests of the individual members. The letter described municipal trading as nothing more or less than the beginning of Bolshevism (surely it began a very long time ago!), but it did not take into account the assistance which the Council's Demonstration Hall is lending to the general extension of electricity supply in the district or the convenience of the service rendered by the Department to the small consumer. The Hall is situated a considerable distance

from the contractor's own shop premises. The Gas Company has a fine showroom in the neighbourhood, and if electrical contractors cannot make displays on such a scale they must be content to see such electricity halls as that in Mare Street. If electrical development can only proceed at the pace it merits there will be work for both contractors and municipalities.

An Index of Consumers.—The Hackney Electricity Committee has considered the question of keeping records of development in the Sales Department and has recommended the introduction of a card index of consumers so arranged that the names of all consumers can be seen on the visible edge of the card on which numbers are printed. These numbers would represent lighting, heating, cooking, power, &c. By the use of coloured transparent signals it could be seen what part of the business required most development in any particular road, and what business had been obtained. This system also lends itself to the classification of trades, which is needed for circulating invitations to lectures, demonstrations, &c. Alderman Genese, in moving that the proposal be referred back, stated that he was opposed to the municipal sale of electrical appliances. He mentioned that the Council had secured a monopoly of a vacuum cleaner, and local retailers were compelled to purchase these appliances from the Council in order to supply their customers. The amendment that the scheme be referred back was lost.

Radio Apparatus in Poland.—*Commerce Reports* says that increased activity in the radio field prevails in Poland. A broadcasting station is being erected in Cracow, and an ex-Prime Minister, in conjunction with the Polish electrical firm of Sila & Swiatlow has been granted a concession to build a station and manufacture and sell radio equipment. Foreign capital participates to a considerable extent in this departure, and the combination is to take over the Government factory which produces telegraph and telephone apparatus.

The Business Efficiency Exhibition.—The Business Efficiency Exhibition, organised annually by the Office Appliance Trades Association, was opened by Sir R. Woodman Burbidge, Bart., on February 10th; it closes to-morrow (Saturday). As in previous years, all kinds of office aids are in evidence, including many electrically-operated machines such as typewriters, calculating machines, time recorders, and duplicators. Intercommunication systems are exhibited by the Reliance Telephone Co., Ltd., Dictograph Telephones, Ltd., and the British Home and Office Telephone Co.

Egyptian Railway Contracts.—The Metropolitan Carriage Works has been awarded a contract by the Egyptian State Railways for the supply of one thousand open low-sided 10-ton wagons. Messrs. Dorman, Long & Co. have been awarded a contract for the supply of 100,000 steel sleepers, and Messrs. Guest, Keen & Nettlefolds have secured a similar contract. The contracts for two further lots of 100,000 steel sleepers have not yet been placed.—*Reuter's Trade Service* (Cairo).

Trade Facilities Acts Extended.—The period under which guarantees may be extended to British traders in the carrying out of projects which employ British materials was to come to an end on March 31st next. The Government has decided, however, to extend the period for a further year and to increase the aggregate amount which may be guaranteed from £70,000,000 to £75,000,000. It is estimated that at March 31st next £5,000,000 of the original sum will remain unused; therefore, the total balance available will be £10,000,000.

The Overseas Trade Acts are to be extended also. The total of guarantees under these is to remain at £26,000,000, but the dates by which they must be granted and beyond which they cannot remain in force are to be extended to September 8th, 1929, and September 8th, 1933, respectively.

Electric Traction in Brazil.—The *Monthly Review* of the Bank of London and South America, Ltd., states that the English Electric Co., Ltd., has presented a proposal to the State Government of Sao Paulo for the electrification of the Cantareira Tramway at a cost of 11,197 contos of reis (about £1,260,000). A concession is being sought to construct and operate an electric line from Sao Paulo to Santos for the transport of passengers and goods. The State Government of Sao Paulo has granted a concession for an electric railway from Espirito Santo do Pinhal to Caracol, a distance of 21 km. The Cia. Electro-Metallurgica de Ribeirao Preto has asked the Government for a subsidy of 3,000 contos for the construction of a railway line between Ribeirao Preto and the Rêde Sul Mineira Railway. The Paulista Railway has completed the electrification of its lines from Campinas to the Tatú station and is proceeding with the conversion of the Rio Claro line.

For Sale.—Victoria Park Hospital, Bethnal Green, invites offers for surplus generating plant. Kingston-upon-Hull electricity department invites offers for surplus generating plant. Mr. H. J. Shaw will sell by auction on February 24th, at 13, High Holborn, W.C., stocks of wireless, electrical and telephone goods. Watford Borough Council electricity department has for disposal a Willans turbine with an E.C.C. 1,000-kW alternator. (See our advertisement pages to-day.)

Municipal Retail Trading.—In a pamphlet which it has just issued, the Electrical Contractors' Association characterises municipal electrical trading and contracting as a "threat to the industry." It fears that the precedent set by the granting of full trading powers to the Barrow, Bath and Burnley Corporations last year will be followed in other cases, and calls for co-operation between supply authorities and contractors rather than competition.

Price Increases in France.—As a result of the fall in the value of the franc several of the radio apparatus manufacturing concerns in France have lately found it necessary to advance their prices to the extent of about 20 per cent.

Irish Free State Electrical Exports.—Electrical goods to the value of £7,709 were exported from the Irish Free State during the nine months ended with September last as against £1,985 in the similar period of 1924.

Our Radio Exports.—In the *Wireless Trader* for February 10th, statistics appeared showing the distribution of British radio apparatus exports during 1925. The total value of these (including valves and re-exported goods) was £1,335,087. Our principal customer was Japan, whose share was valued at about £214,000. Australia was next in importance, having taken goods to the value of about £200,000, and was followed by the Irish Free State (£83,000), the Netherlands (£65,000), the United States (£55,000), India (£55,000), Canada (£53,000), and South Africa (£51,000).

Calendar and Salary Schedule.—We have received from the Electrical Power Engineers' Association a wall calendar for 1926, which sets out the basic salaries of power station technical staffs and a cost-of-living variation table.

New French Companies.—La Société Générale des Condensateurs et Appareils de Protection Electrique is the name of a new concern which has lately been organised in Paris (73, Rue Notre Dame des Champs) with a capital of 500,000 fr., to acquire and develop the business of the Société La Protection Electrique Capart-Dubilier.

La Société l'Herault Electrique is the name of a new company which has lately been formed at Laroque (Department of Herault) with a capital of 1,100,000 fr., to acquire and extend the hydro-electric station at Laroque.

La Société des Véhicules et Tracteurs Electriques (Vetra) is the name of a new company which has lately been formed in Paris (186, Rue du Faubourg Saint Honoré), with a capital of 300,000 fr., to construct industrial electric vehicles and tractors.

La Société des Ondes Dirigées is the name of a new concern which has lately been organised in Paris (46, Rue de la Tour), with a capital of 200,000 fr., to manufacture radio and electrical apparatus.

A company has lately been formed in Paris (94, Rue de la Victoire) with a capital of 2 million fr. and the title La Société Industrielle de la Ville et du Port de Tenes (Algerie), to establish a central electricity distribution system in the town and district of Tenes, Algeria.

The Japanese Market.—*Commerce Reports* states that the past year witnessed a great improvement in conditions in Japan. The prospects for immediate sales of electrical, steam and hydro-electric generator units and equipment are extremely favourable owing to the prosperous condition of the electrical power companies and the probability of industrial and other demands. On the other hand, business in radio apparatus is quiet. This is attributed to the lack of variety in the broadcast programmes. There is some dumping of accumulated stocks.

The I.M.E.A. : Change of Address.—The address of the Incorporated Municipal Electrical Association has been changed to: Electric House, 38, High Street, Croydon. Tel.: "Croydon 1152." Extn. No. 3.

Lighting and Power Notes.

Aldershot.—OPPOSITION TO BILL.—The Town Council is to oppose the Bill of the Metropolitan Electricity Supply Co., which seeks powers to supply electricity in parts of Surrey, Northants., Berks., and Bucks.

Bradford.—STREET LIGHTING.—The City Council has decided to ask the Sheffield Corporation to allow its street lighting superintendent to advise the Council in the matter of street-lighting improvements.

Clayton.—ELECTRICITY SUPPLY.—By invitation of the Bradford Corporation Electricity Committee, representatives of that Committee and of the Urban District Council recently met in private conference to discuss the situation affecting electricity supply to Clayton, for which both the Bradford Corporation and the Electrical Distribution of Yorkshire, Ltd., are seeking powers. The Clayton local authority favours a supply from Bradford. The Council received a letter recently from the Yorkshire Electric Power Co. (an associate company of the Electrical Distribution of Yorkshire, Ltd.), stating that it intends to lay cables in certain parts of Clayton within one month.

Continental.—HOLLAND.—The A.E.G. of Berlin has recently completed a 24,000-kW steam turbo-generator for the power station at The Hague. The set runs at 3,000 r.p.m. and is one of the largest high-speed turbines so far constructed.

BELGIUM.—The Société d'Electricité de la Campine, has completed plans for the establishment of a large central power station in the New Campine coalfield for the supply of electricity to the provinces of Limbourg and Antwerp.

The authorities of the Province of Liége are to raise a loan of 10 million fr. for the electrical development of the province.

FRANCE.—The authorities of the Loire-Inférieure Department have been authorised to raise a loan of 9½ million francs for rural electrification purposes.

At the recent annual meeting of the Société Bethunoise d'Eclairage et d'Energie, of Bethune, it was stated that the

Company was now supplying electricity to 308 villages, with 72,237 consumers, the latter representing an increase of 13,606 during the past 12 months. The Company has now about 860 miles of h.p. cable and 770 miles of l.p. mains in operation.

The authorities of the Department of the Nord have recently voted a credit of one million fr. for the extension of the electricity supply facilities in the rural districts of the Department.

NORWAY.—By the utilisation of the waterfall at Rjukan, the Norsk Hydro-Elektrisk Kvaelstof Aktieselskap is now developed to a total capacity of 240,000 kW, and the plant has a daily output of 5,700,000 kWh. The annual output of the Rjukan hydro-electric plants is now about 2,000,000,000 kWh.

Coventry.—OPPOSITION TO BILL.—The City Council is to oppose the Leicestershire and Warwickshire Power Bill, 1926, on the ground that it contains a clause which does not give sufficient protection to the interests of the Coventry undertaking. It was stated at a recent meeting that the company only proposed to supply in bulk, and would not incur the expense and responsibility of distribution as was the case with the Coventry station, and would therefore set up unfair competition.

Dalkeith.—TRANSFER OF UNDERTAKING.—The Town Council has received the sanction of the Electricity Commission to the proposal to take over the local undertaking of the Electric Supply Corporation, Ltd., on April 1st. The purchase price is £18,000.

Denholme (Yorks.).—ELECTRICITY SUPPLY.—The Urban District Council has decided not to proceed with its application for an Order to distribute electricity, but to support the application of the Electrical Distribution of Yorkshire, Ltd., which has agreed to have the supply available within two years if the Order is granted.

Holmfirth.—LOAN.—The Urban District Council is applying for sanction to the borrowing of £5,000 for electricity extensions.

London.—HAMMERSMITH.—The Electricity Committee has recommended the following revised scale of electricity charges as from the meter readings for the quarter ending March 31st next:—General lighting supplies: (Prepayment), 5d. per kWh; (ordinary), varying from 4½d. per kWh for the first 10,000 kWh per annum to 3d. per kWh for all energy consumed in excess of 50,000 kWh. Industrial power, cooking, and heating, &c., 1.4d. per kWh. Special rates for large consumers of electricity for combined lighting, heating and power purposes. The following two alternative "all in" tariffs for private premises are recommended:—(1) Fixed annual charge of 10 per cent. of the rateable value of the premises, plus 1d. per kWh for electricity consumed; (2) Fixed annual charge at the rate of £8 per kW on the lighting installation only, plus 1d. per kWh consumed.

The borough electrical engineer has submitted a report on the extension of h.p. feeders in the Brook Green, Shepherd's Bush, and Hythe Road districts, and the Committee has recommended that the most satisfactory method is to provide an additional e.h.p. three-phase ring main between the generating station and the Osram-G.E.C. Lamp Works, Brook Green, and to transfer the whole of the load of these premises direct to the 3-phase distribution. It is also proposed to draw in an additional 3-phase feeder between the Osram-G.E.C. Lamp Works and the Wood Lane sub-station, to deal with the additional load at the latter point and to provide connecting cables between this sub-station and the new sub-station to be built on Shepherd's Bush Green, in order that the load in the vicinity of Uxbridge Road may be transferred to this new feeding source. The estimated cost of the complete scheme is as follows:—E.h.p. 3-phase cables, £6,452; mains from Wood Lane sub-station to Shepherd's Bush Green sub-station, £3,582; switchgear, transformers, &c., £4,492.

HACKNEY.—The Electricity Committee has recommended that the seal of the Council be affixed to the petition of the Conference of Local Authorities Owning Electricity Undertakings against the Metropolitan Electric Supply Company Bill, 1926.

ST. PANCRAS.—The Electricity Committee has recommended that application be made for sanction to a loan of £4,000 for laying an additional feeder main into the King's Cross district.

FULHAM.—The Electricity and Lighting Committee has recommended that an expenditure of £11,296 be authorised for extensions of mains, and that application be made for sanction to a loan of £27,539 for electricity purposes.

Motherwell.—LOAN SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing of £4,141 by the Town Council for additional mains required in connection with the supply of electricity to the London, Midland and Scottish Railway Company's sheds and workshops.

Northern Ireland.—LETTERKENNY (CO. DONEGAL).—The Urban District Council is applying to the Local Government Department for sanction to a loan of £8,000 to cover the cost of the proposed electricity scheme. The plant will include two 45-kVA sets, and it is intended that the scheme will be such as to suit immediate change to the national scheme. The system of supply will be a.c., 3-phase, 230 V and 400 V.

Padiham.—ELECTRICITY IN BULK.—At a recent meeting of the Urban District Council, the Lancashire Electric Power Co. complained that, although electricity had been available for some time, the Council had not yet completed arrangements. Councillor Wiggins said the Council had for some time negotiated over a draft agreement under which the Company was to undertake distribution for 21 years. The draft agreement needed modification, and some members of the Council favoured the Council's undertaking its own distribution. He moved that the Council break off negotiations and arrange to distribute electricity itself by taking a bulk supply from the Company. The proposal was approved.

Peterborough.—LOAN.—Application is being made by the Town Council for sanction to a loan of £140,700 for extensions at the generating station. The amount is made up of the following items: Buildings, coal handling plant and other accessories, £79,250; overhead 50-ton crane, £1,754; switchgear and accessories, £8,666; a 6,000-kW turbo-alternator (estimated), £24,000; two boilers and pulverised fuel plant (estimated), £26,330; salary of temporary resident engineer, £700.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

STRATFORD-ON-AVON.—*The Stratford-on-Avon Electricity Co., Ltd.*—Lighting: From 1s. to 10d. per kWh. Heating: From 4d. per kWh for the first 200 kWh and 3d. thereafter, to 3d. per kWh for the first 400 kWh, and 2d. beyond that amount. Cooking: From 2½d. to 1½d. per kWh. Power: From 5d., 4½d., and 4d., to 5d., 4d., 3½d. and 2d.

CHASETOWN.—*The Cannock Chase Colliery Co., Ltd.*—Lighting: Quarterly meters, 7d. per kWh; prepayment meters on free wiring system, a rebate of 3d. in the 1s. on all electricity consumed in excess of 10 kWh for the winter quarters and 5 kWh for the summer quarters.

EAST HAM.—Power: All electricity consumed in excess of 12,500 kWh per quarter, from 2d. to 1½ per kWh.

BERMONDSEY.—Lighting: from 5½d. to 5d. per kWh. Power: a reduction of 5 per cent.

FULHAM.—Private lighting: from 4½d. to 4¼d. per kWh. (A corresponding reduction to all slot-meter consumers.) Heating and power: from 1½d. to 1¼d. per kWh. Public lighting: from 1½d. to 1¼d. per kWh. Power taken under kW system: from £4 10s. to £4 per kW.

CLONMEL (CO. TIPPERARY).—Lighting: From 1s. to 10d. per kWh.

Ripon.—ELECTRICITY SUPPLY.—The Electricity Committee is to interview the Harrogate Corporation, which is prepared to supply electricity in bulk to Ripon. The Committee has agreed to interview representatives of any municipal authority or company on the subject either of bulk purchase, lease of powers for supply and distribution, or by generating electricity by a municipally-owned plant.

Silsden (Yorks.).—ELECTRICITY ORDER.—The Urban District Council, after long negotiations with the Yorkshire Electric Power Co., has decided to apply for an Order of its own, with a view to providing an electricity supply for the district.

South Molton.—ELECTRICITY SUPPLY.—The Town Council has decided to offer no objection to the application of Dr. Purves for a Special Order for the supply of electricity in the borough subject to a clause being inserted in the Order protecting the interests of the Council.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them for the supply by the Wallingford and District Electric Supply Co., Ltd., of electricity in the borough of Wallingford and part of the rural districts of Crowmarsh and Wallingford.

Application has been made by the Slough and Datchet Electric Supply Co., Ltd., for a Special Order authorising it to supply electricity in certain parishes in the rural district of Eton.

Stafford.—LOAN.—The Electricity Committee is applying for sanction to the borrowing of £67,400, made up as follows:—Buildings, £4,400; mains, £29,700; machinery, £33,000. The Town Council has confirmed the proposal.

Stanhope. — ELECTRICITY SUPPLY. — The Urban District Council, at a meeting on February 8th, received a report on the proposed electrification of Weardale, and decided to apply for the necessary powers. It was also agreed that the Council should apply to the Unemployment Grants Committee for a grant toward the cost of the scheme.

Sutton Coldfield.—LOAN.—The Town Council is applying for sanction to a loan of £5,000 for mains and extensions.

Torquay.—ELECTRICITY EXTENSIONS.—The Town Council has applied for sanction to a loan of £990 for transformers and switchgear at the power station in order to convert a portion of the Newton Abbot distributing network from d.c. to a.c. A loan is also to be applied for for the permanent extension of the main sub-station in Upton Valley. The electrical engineer reports that, owing to the increase in consumers, the second new 3,000-kW set will probably only meet the demand for another two or three years, and that at the end of the present year it will be necessary to consider whether power-station extensions involving the installation of a 6,000-kW turbo-alternator shall be put in hand.

United States.—ELECTRICAL DEVELOPMENT.—According to the *Electrical World*, the completion this year of the first section of the Kearney (N.J.) generating plant, which is to be operated by the Public Service Electric and Gas Co. and has been under construction since July, 1923, will add greatly to the capacity of the company's system. The equipment to be installed in the new Kearney station includes five turbo-generators, three of 39,200-kVA capacity, and two of 43,750

kVA each. The first of these generating units has already been put into service, and the second unit will be completed shortly. The first section of the Kearny station will thus have a capacity of 205,100 kVA. The second section, when built, will double this rating. Eighteen steel towers have been erected to carry 132,000-V cables connecting Kearny with the Essex and Marion generating stations. Upon completion of the present project, this linking-up will make available a total capacity of 504,500 kVA, and with the erection of the second section the combined capacity of the stations will be 709,600 kVA, making the generating plant one of the largest in the country.

Walsall.—ELECTRICITY EXTENSIONS.—With a view to giving a supply of electricity to the institutions of the Walsall and West Bromwich Unions Joint Committee at Great Barr, the Corporation proposes to carry out the necessary extension of mains at an estimated cost of £3,000.

Walton-le-Dale.—STREET LIGHTING.—The Lighting Committee has decided to ascertain the cost of converting the present street lamps from gas to electricity.

West Bromwich.—SCHEME REJECTED.—The Town Council has rejected a recommendation of the Electricity Committee to spend £17,926 in laying cables in connection with the new scheme of the Joint Electricity Authority for the Midland area.

Yeadon.—ELECTRICITY IN SMALL HOUSES.—The Urban District Council has considered the question of the installation of electric lighting in the Council's houses, and the surveyor has been instructed to obtain data as to cost, &c., and to report with a view to application being made for the sanction of the Ministry of Health to the scheme.

Tramway and Railway Notes.

Brazil.—SAO PAULO.—According to the *Manchester Guardian Commercial*, the Government is to obtain permission from the Federal Government to construct a new port, to extend the track of the Sorocabana Railway to the new port, and to start credit operations abroad so that this programme may be carried out. It is estimated that £7,000,000 will be required to construct and equip the new port and to extend and electrify the Sorocabana Railway to the coast.

Continental.—FRANCE.—The authorities of the Department of Ile-et-Vilaine have placed the contract for the electrification of the tramways in Brittany with the Société d'Exploitations Electriques, of Paris, which has already commenced operations. The old rolling stock is to be utilised, and contracts will shortly be placed for nine electric locomotives.

SWITZERLAND.—It is reported from Berne that, although the first stage of the electrification of the Swiss railway system is expected to be completed at an earlier date in 1928 than was at first contemplated, the authorities have decided not to proceed with a further electrification programme at present, as it is considered that the economic position is not such as to permit of increased capital outlay on the railways, and it is also desired to await further results of the cost of working the electrified railways.

SPAIN.—Plans are being prepared for the construction of an electric tramway between Muchamiel and Jijora, in the Province of Alicante.

GERMANY.—It is reported from Berlin that a beginning will probably be made this year with the long-projected work of the electrification of the Berlin city and circle railway and the connecting suburban lines. The expenditure on the work is estimated at from £5,000,000 to £10,000,000 and a period of three years would be required to complete the conversion of the total length of 97 miles concerned. A second scheme relates to the suggested conversion of the section between Frankfort-on-Main and Basle. The construction of the power station would involve an expenditure of £1,250,000, and the conversion of the Frankfort-Basle section from £2,250,000 to £2,500,000, while £5,500,000 is estimated as the cost of the provision of the electric locomotives in connection with the provisionally projected electrical equipment of the new Baden main lines.

Dundee.—PURCHASE SCHEME REJECTED.—In connection with the Town Council's proposal to purchase the tramway undertaking of the Dundee, Broughty Ferry and District Tramway Co., Ltd., the question was considered at a recent meeting of the Council, when it was decided not to purchase the undertaking, on the grounds of high cost, and the possibility of motor omnibus competition. The proposed purchase price was £85,000.

Glasgow.—INQUIRY COMMITTEE.—According to the *Electric Railway and Tramway Journal*, the Corporation Tramways Committee on Finance has appointed a special sub-committee to examine the traffic and revenue returns of the various tramway routes on the system. It is to inquire into (*a*) the non-paying routes; (*b*) the decline in the revenue per car mile from 21.31d. in 1920-21 to 17.02d. for the current year; the expansion of the system; the increased mileage run, and the decreased revenue during the period under consideration; (*c*) the increase of the department's financial burdens; and (*d*) the cost of the foregoing matters, and to submit a report thereon with recommendations.

Java.—RAILWAY ELECTRIFICATION.—*Commerce Reports* states that according to recent reports the electrification of the line Manggarai-Buitenzorg has been sanctioned by the Government. Plans for the project are now entirely completed, the execution of the work has already been commenced, and the necessary material will be ordered immediately. It is expected that the electrification of the entire line will be completed in two years. An amount of 100,000 guilders has been appropriated for preliminary work in connection with the electrification of the Poerwakarta-Bandoeng line, which will probably be the next to be electrified.

London.—BLACKFRIARS STATION.—Important structural alterations are to be made to Blackfriars station to enable it to be linked up with the public subways and also to improve the facilities for handling the traffic at the station itself. The station entrance is to be widened and will lead to a new booking hall 2,500 sq. ft. in area at the existing bridge level. The rearrangement will also permit of an improvement in the interchange facilities between the District Railway and Southern Railway Company's stations. The passimeter system of booking will replace the present type of booking office. Work on the new station is to start at once and it is expected that it will be completed in nine months' time.

Northern Ireland.—PROPOSED ELECTRIC RAILWAY.—It is understood that a syndicate is about to be formed in Newcastle, County Down, with a view of raising £50,000 capital for the construction of an electric railway to the top of Slieve Donard, 2,076 ft. above sea level. The aim of the promoters is to make the ascent from the southern end of the town, *via* the Millstone Mountain, thence to the south side of Thomas Mountain direct to the summit. It is proposed that the descent should be by another route, *via* the Pot of Pulgrave, thence down the slopes of Drinnahilly on the west side of the town.

United States.—NEWARK (N.J.).—The *Electric Railway Journal* reports that the Pennsylvania Railroad, the city of Newark and the Public Service Corporation of New Jersey have recently reiterated their willingness to enter upon a programme for the expenditure of $25,000,000 for the construction in Newark of a new union terminal and the laying of a vast network of high-speed surface lines, linking northern and western Jersey with Newark. The scheme includes the abandonment of Manhattan Transfer, the extension of the Hudson Tube system to southern sections of Newark, three double-track steel bridges over the Passaic River to accommodate increased traffic brought about by the transfer from electric to steam locomotives at Newark, and the erection of a Pennsylvania passenger station and steam terminal at Wright Street, in the down-town section of Newark. Transportation systems involved in the plan include steam and electric railway lines, electric surface and subway lines and 'buses. The Public Service Railway and railroad branches have the most definite transportation plan outlined for them. This includes a high-speed surface line into north Jersey and the west of Essex County for the passenger traffic to the Newark terminal.

Telegraph and Telephone Notes.

Czecho-Slovakia.—The Postal Administration displayed great activity in developing the Czecho-Slovak telephone and telegraph systems during 1925. It has linked up important commercial and industrial centres with large towns, connected many provincial towns with existing systems, and created local means of communication, exchanges, &c. From January 1st to December 31st (1925), 226 new inter-urban telephone lines and 183 telephone stations were inaugurated. This year the installation of new international telephone lines—Prague-Paris, Prague-Vienna, and Prague-Cracow—will be proceeded with specially. It is also proposed to extend the Prague suburban telephone system, to install at Moravska Ostrava relay plant (of English construction) for international communication, to put into service the inter-urban telephone exchange at Zizkov, and to establish new exchanges at Prerov, Prostejov, Decin, Zvolen, Nové, Zámky, and Poprad.—*Reuter's Trade Service* (Prague).

Italy.—NEW RADIO SERVICE.—The Società Italo-Radio has recently inaugurated a wireless telegraph service between Italy, Egypt, Palestine, and Iraq.

Japan.—TELEPHONE INSTALLATION COST.—It is reported that in Tokio new telephone subscribers must bear the entire expense of installation, at a cost of from 1,500 to 1,700 yen. With the yen at par this would be about £160 in English money. In this country telephone installation is free.

Marine Radio Operators.—STRIKE ULTIMATUM.—A conference between the Association of Wireless and Cable Telegraphists and Mr. J. C. A. Ward, chairman of the Engineering Employers' London and District Association, held at the Board of Trade on February 13th, ended in complete failure to reach agreement. The employers, appreciating that they have exhausted the provisions for avoiding disputes contained in the agreement of April 4th, 1923, and having offered proposals for settlement of the strike, which provided for arbitration on all points arising therefrom, have come to the conclusion that it is essential to rehabilitate the service. Accordingly one month's notice, from February 13th, was given to terminate the agreement of April 4th, 1923, but it will be withdrawn

in the event of the A.W. and C.T. accepting this week the terms of settlement of the present dispute as submitted by the employers through the Ministry of Labour on January 27th. In the event of their non-acceptance, the employers will offer to operators signing on in the United Kingdom employment on conditions suitable to the service requirements.

Post Office Accounts.—1925 FIGURES.—The commercial accounts of the Post Office and returns relating to capital borrowings for telegraph and telephone purposes for the year ended March 31st, 1925 (issued as a White Paper 175, price 9d.), show that the surplus on the telephone service was £463,006 (against £1,596,917 in the previous year), and that the deficit on the telegraph service amounted to £1,645,525 (against a deficit of £1,270,925 in 1925). Telephone revenue increased by £414,966 to £14,782,229, while telegraph revenue decreased by £165,199 to £4,981,580. The Post Office wireless services resulted in a deficit of £27,915, which, with a further sum of £7,736 for experimental work and interest on capital, amounts to a deficit total of £53,358 for the year. Message fees, &c., provided an income of £164,342.

South America.—TELEGRAPH SERVICE.—It is announced that the South American republics of Ecuador and Colombia have lately joined the Bureau International de l'Union Telegraphiqué.

The Telephone Service.—NEW EXCHANGE.—A new telephone exchange, of up-to-date central battery design, was opened at Hoylake on Saturday afternoon, February 13th.

Transatlantic Telephony.—RUGBY TESTS.—It is understood that two-way radio-telephone tests were carried out between the new Government station at Rugby and New York on, and since, February 7th. The experiment commenced at 4 a.m. and lasted until 7.30 p.m., and the results are stated to be very promising; the conversation was also heard in Australia. Transmission took place at Rugby, and reception from New York was carried out at the Post Office station at Wroughton, near Swindon, being relayed through London to Rugby.

Radio Notes.

International Wireless Conference.—WAVE-LENGTH REDISTRIBUTION.—A European conference, to which delegates of all existing or projected wireless organisations have been invited by the International Wireless Office at Geneva, is to be held on March 25th and the following days at Geneva. The conference will be preceded by a general assembly of old and new members of the International Wireless Union. In the course of the meetings proposals for the allotment of wave-lengths for the different European stations will be put forward, experiments which have been made with this end in view being now practically completed.—*Reuter* (Geneva).

Licences.—PROSECUTIONS.—Fining a man 10s. 6d. with 31s. 6d. costs at Hull, on February 10th, for having an unlicensed crystal set, the stipendiary magistrate said the licence must be obtained before the parts were put together, and whether the results were good or bad. A written reply to a question in the House of Commons points out that since the passing of the Act of last session, proceedings have been instituted in 49 cases; 43 cases have been tried, of which 42 were successful, the fines imposed ranging from 4s. to £20 10s.

Post Office Accounts.—B.B.C. LICENCE FEES.—The commercial accounts of the Post Office and returns relating to capital borrowings for the year ended March 31st, 1925 (issued as a White Paper 175, price 9d.), show that the income from the sale of broadcast radio receiving licences to the public during the year was £599,261, of which sum £472,003 is shown to be payable to the British Broadcasting Co., the department retaining £127,258, which is subject to certain adjustment. During the previous year receipts for licences issued totalled £250,055. Licences of the B.B.C. during 1924-25 are returned at £803, compared with £366 in the previous year. On the expenditure side of the account it is shown that administration expenses at headquarters in respect of the issue of licences were £23,770 (in 1923-24 the figure was £23,560), and issue to the public cost £50,411, against £14,463. The year resulted in a surplus of £54,346, over double the previous figure of £20,729.

The daily Press has lately drawn attention to the ultimate effect of a clause in the Supplementary Broadcasting Agreement which came into operation last year. This clause provides that the Postmaster-General shall have the right to reduce the proportion of the licence fee payable to the B.B.C., according to the number of licences and the Company's expenditure. Also, any surplus, after allowing for the depreciation and obsolescence of plant and a maximum dividend to the B.B.C. shareholders of 7½ per cent., must be surrendered to the Post Office. The Postmaster-General decided to limit the B.B.C.'s total income to £500,000, and on June 31st, 1926, the B.B.C. will find its proportion of the licence fees very much reduced. At the moment licences number approximately 1,850,000, bringing in a total of £925,000 per annum. Under the ruling which has hitherto existed, the B.B.C. would receive £693,750 and the Post Office £231,250. The P.M.G.'s limitation would mean that the Post Office would receive £425,000 and the B.B.C. £500,000, but the Company maintains that it should have a larger share of the licence money.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—March 31st. New South Wales Government Railways. One air compressor for Zarra Street power house.

April 21st. Four motor-generator sets and four switch-operating batteries for Hornsby and St. Leonards sub-station. Specifications from Chief Electrical Engineer, 61, Hunter Street, Sydney.

MELBOURNE.—April 7th. City Electrical Department. One 2,000-kW rotary converter, with transformer and accessories,* d.c. switchgear and accessories, and one a.c. control panel.*

April 7th. Victorian Government Railways. One hydraulic plate-bending press.*

Bedford.—March 3rd. Electricity Department. E.h.p., h.p., and l.p. underground cables for 12 months. (See this issue.)

Bristol.—February 25th. Board of Guardians. Electrical fittings for six months. Mr. T. S. Lamb, clerk, St. Peter's Hospital.

Cardiff. — February 22nd. Electricity Department. Twelve months' supply of paper-insulated cables, one 1,500-kW rotary converter, and one 2,000-kW ditto. (February 5th.)

March 8th. One 10,000-kW turbo-alternator and condensing plant. (February 5th.)

Edinburgh.—March 8th. Electricity Supply Department. One 25,000-kW turbo-alternator with condensing plant, or alternatively, one 20,000-kW turbo-alternator with condensing plant. (February 5th.)

Hoyland (near Barnsley).—February 26th. Electric lighting installation at Hoyland Council school. Specifications from Mr. A. Rayner, 151, Cross Hill, Ecclesfield, near Sheffield.

Huddersfield.—February 25th. Town Council. Electrician's work in erection of 45 houses, off Town End, Almondbury (5 blocks). Specifications, &c., from Borough Architect, 26, Ramsden Street.

Hull.—Corporation Electricity Committee. Automatic table telephones and bell sets. (See this issue.)

Leeds.—March 2nd. Tramways and Transport Department. Stores for year ending March 31st, 1927, including electrical sundries. Particulars from Mr. W. Chamberlain, general manager, 1, Swinegate.

Leicester.—Electricity Department. One 18,750-kW, 3-phase turbo-alternator, with condensing plant. (February 12th.)

Leytonstone.—West Ham Union. Alterations to the electric lighting station and the installation of a steam-driven generating set, &c., at the Central Home, Leytonstone. (See this issue.)

London.—ST. PANCRAS.—March 2nd. Electricity Department. E.h.p. switchgear at the Grafton Road sub-station. (February 5th.)

METROPOLITAN ASYLUMS BOARD.—February 24th. Installation of electric lighting at the Upper Southern Convalescent Fever Hospital and the Joyce Green Hospital, Dartford. Installation of kitchen fittings and appliances at the North-Western Fever Hospital, Lawn Road, N.W.3. (February 12th.)

Manchester. — March 22nd. Electricity Department. 3-phase, 420-V sub-station switchgear, 3-phase, 6,600-V and 11,000-V ditto, three 500-kVA static transformers, and one 7,500-kVA forced-air-cooled transformer. (See this issue.)

Newark-upon-Trent.—March 1st. Corporation. Two electrically-driven centrifugal pumps. (February 5th.)

New Zealand.—WELLINGTON.—April 23rd. Public Works Department. 11,000-V metering equipment and switchgear for the Arapuni electric power scheme.*

Oldham.—March 2nd. Electric lighting fittings at Bardsley Conservative Club. Particulars from Mr. E. W. Robins, secretary.

March 8th. Board of Guardians. Electric lamps and fittings. Form of tender from Mr. F. W. Fletcher, clerk to Board of Guardians, Union Offices.

Portsmouth.—Electricity Supply Department. Erection of a steel-frame turbine house. (See this issue.)

Richmond-upon-Thames.—February 22nd. Town Council. Electrically-driven centrifugal pump, with switchgear, &c. Mr. Hugh P. Williamson, water engineer, Riverside.

South Africa.—JOHANNESBURG.—April 12th. S.A. Railways and Harbours. Electrification of Cape Town Suburban Railway. Supply and erection of the overhead equipment of the permanent way and overhead transmission and distribution lines. (February 12th.)

CAPE TOWN.—March 17th. Electricity Department. Electric cables, electric light poles, cross arms, insulators, &c.

MOOREESBURG.—March 20th. Municipal Council. Engine-room equipment, including oil engines and tanks, main generators, motor booster, pumps and air compressor, travelling crane, switchboard, battery and connections, distribution system, instruments, meters, &c.; and house service connections.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Andover.—Town Council. Accepted:—
Installing pump at the water works (£1,617).—Edwards & Armstrong, Ltd.

Australia.—MELBOURNE.—Postmaster-General's Department.
515 tons h.d. copper wire (£53,327).—British Insulated Cables, Ltd.
Automatic telephone exchange equipment, Canberra (£11,828).—Automatic Telephones, Ltd.

State Electricity Commission of Victoria.
6,600-V and l.p. lead-covered and armoured cables.—British Insulated Cables, Ltd. (£12,525); Johnson & Phillips, Ltd. (£1,347).
Electric lamps (£3,522).—Edison Swan Electric Co., Ltd.
22,000-V and 6,600-V lead-covered single-core cables (£1,342).—Johnson and Phillips, Ltd.

Melbourne and Metropolitan Tramways Board.
Two motor equipments (£6,006).—Metropolitan-Vickers Electrical Co., Ltd.
Air-brake equipments.—Westinghouse Brake Co. (£148); Australian General Electric Co. (£992).
—Tenders.

Carlisle.—Electricity Committee. Accepted:—
Works and instruments for boiler-house (£200).—Stirling Boiler Co., Ltd.

East Ham.—Electricity Committee. Accepted:—
Cable and joint boxes (£1,077).—Enfield Cable Works, Ltd.

Gravesend.—Electricity Committee.
Circulating-water and exhaust pipes:—

Foster Bros.	£1,283
Stewart & Lloyds	1,170
Aiton & Co., Ltd.	1,145
Scottish Tube Co.	1,025
John Thompson, Ltd.	925
The Steel Pipe Co.	906
H. & T. Danks, Ltd.	850
John Spencer, Ltd.	834
Clayton, Son & Co., Ltd. (Recommended.)	**755**
Bolling & Lowe, Ltd.	731

Lamp Contract.—The Government of Northern Ireland has placed a contract for carbon drawn-wire and gasfilled lamps with Edison Swan Electric Co., Ltd.

Leigh (Lancs.).—
2,000-kW, h.p. turbo-alternator set at Messrs. J. & J. Hayes, Ltd., cotton spinners.—Metropolitan-Vickers Electrical Co., Ltd.

London.—LONDON COUNTY COUNCIL.—Education Committee. Accepted:—
Extension of electric lighting installation at Park Central School, Greenwich (£85).—A. Dean & Co.
50 sets collecting gear.—Edison Swan Electric Co., Ltd.

KENSINGTON.—Finance Committee. Recommended:—
Synchronised time system at town hall (£255).—Magneta Time Co., Ltd.

SHOREDITCH.—Electricity Committee. One 1,000-kW turbo-generator, complete with condenser, pumps, air cooler and circulating-water pipes, &c.:—

Fraser & Chalmers Engineering Works (Recommended)...	**£43,608**
British Thomson-Houston Co., Ltd.	£43,716
Metropolitan-Vickers Electrical Co., Ltd.	£44,765
English Electric Co., Ltd.	£45,264

Boiler plant:—

		Evaporative capacity of boiler. lb.
Stirling Boiler Co., Ltd. (Recommended)...	**£13,600**	**70,000**
(alternative)	£13,109	50,000
Babcock & Wilcox, Ltd.	£12,877	50,000
John Thompson Water Tube Boilers, Ltd....	£11,125	50,000
Clarke, Chapman & Co.	£11,919	50,000
Vickers-Spearing Boiler Co., Ltd.	£12,900	50,000

Luton.—Board of Guardians. Accepted:—
Installing electric lighting at the children's home (£78).—E. W. J. Whitelock & Co.

Middlesbrough.—Corporation. Accepted:—
H.p. cable (£2,745).—Enfield Cable Works, Ltd.

Portland.—Water Committee. Accepted:—
Dynamo, cable and lamps at main station (£126).—Smith & Son.

Prestwick.—Town Council. Accepted:—
Nine 300-V lamps of 600 c.p., for the Esplanade (£273).—Ayrshire Electricity Co.

Sheffield.—Tramways Committee. Recommended:—
25 sets "Maley" electro-pneumatic barkes.—Electro-mechanical Brake Co., Ltd.

South Africa.—DURBAN.—Municipal Council. Accepted:—
2 miles 6,600-V cable (£1,427); 5 tons bare copper wire (£452).—T. Barlow & Sons, Ltd.
385 yd. connecting cable (£218).—British Insulated Cables, Ltd.
10 e.h.p. truck-type switch cubicles (£1,238).—British Thomson-Houston Co., Ltd. Two ditto (£293).—Johnson & Phillips, Ltd.
276 battery plates (£208).—Tudor Accumulator Co., Ltd.
—South African Engineer.

Forthcoming Events.

Diesel Engine Users' Association.—Friday, February 19th. At Caxton Hall, Westminster, S.W. Paper on "Heavy-oil Engine Installations—Choice of Site and Lay-out of Plant," by Mr. G. Porter.

Manchester Electro-Harmonic Society.—Friday, February 19th. At the Albion Hotel, Piccadilly, Manchester. Concert.

British Electrical Development Association Conference.—Friday, February 19th. At Caxton Hall, S.W. At 7.30 p.m. Lecture on "The Electrical Industry and the Architect," by Mr. G. Blair Imrie.

Institution of Mechanical Engineers.—Friday, February 19th. At the Institution, Storey's Gate, S.W. At 6 p.m. Annual general meeting. Paper on the "Measurement of Cutting Temperatures," by Mr. E. G. Herbert.

Junior Institution of Engineers.—Friday, February 19th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Coal-Cutting Machinery," by Mr. S. Reilly.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, February 22nd. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on "Some Changing Characteristics in the Application of Electricity to Public Supply," to be opened by Mr. A. F. Harmer.

Institution of Electrical Engineers—(*continued*).
(Irish Centre, Dublin).—Thursday, February 25th. At Trinity College, Dublin. At 7.45 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(North-Eastern Centre).—Monday, February 22nd. At Armstrong College, Newcastle-on-Tyne. At 7 p.m. "Notes on the Testing of Static Transformers," by Mr. J. L. Thompson and Mr. H. Walmsley.

(North-Midland Centre).—Tuesday, February 23rd. At the Hotel Metropole, King Street, Leeds. At 7 p.m. Paper on "The Electrification of the Paris-Orleans Railway," by M. Parodi.

(North-Western Centre, Students' Section).—Tuesday, February 23rd. At Milton Hall, Deansgate, Manchester. At 7.30 p.m. Paper on "Electric Winding Engines for Collieries," by Mr. H. Pryce Jones.

Royal Society of Arts.—Monday, February 22nd. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture on "The Production and Measurement of High Vacua," by Dr. C. W. C. Kaye. (Lecture II.)
Wednesday, February 24th. At 8 p.m. Paper on "Domestic Heating," by Dr. Margaret Fishenden.

Faraday Society.—Monday, February 22nd. At Burlington House, W. At 5.30 p.m. Ordinary meeting.

Paisley Association of Electrical Engineers.—Tuesday, February 23rd. At 16, High Street, Paisley. At 7.30 p.m. Debate on "Tramways v. 'Buses," to be opened by Messrs. W. R. Bruce and P. Hamilton, Junr.

Institution of Civil Engineers.—Tuesday, February 23rd. At the Institution, Great George Street, S.W. At 6 p.m. Papers on "The Khyber Railway," by Mr. V. Bayley, and on "The Survey and Construction of the Khyber Railway," by Col. G. R. Hearn.

Electrical Power Engineers' Association (Midland Division).—Wednesday, February 24th. At the Grand Hotel, Birmingham. At 7.30 p.m. Lecture on "Protective Gear," by Mr. G. L. Porter.

Association of Consulting Engineers (Incorporated). — Thursday February 25th. At St. Stephen's Club, Victoria Embankment, S.W. At 7 for 7.30 p.m. Annual dinner.

Birmingham Electric Club.—Friday, February 26th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Discussion on "Power Factor Improvement," to be opened by Mr. F. R. Unwin and Mr. F. C. Hall.

Royal Institution.—Thursday, February 26th. At 21, Albemarle Street, W. At 5.15 p.m. Lecture on "The Atom of Light and the Atom of Electricity," by Dr. C. D. Ellis.

Institution of Production Engineers.—Friday, February 26th. At 83, Pall Mall, S.W. At 7.30 p.m. Debate on "Payment by Results," to be opened by Mr. R. H. Hutchinson.

Physical Society of London.—Friday, February 26th. At the Imperial College of Science, South Kensington. At 5 p.m. Ordinary Scientific Meeting.

Notes.

The Electrical Engineers' Ball.—The twenty-second Electrical Engineers' Dance took place at the Hotel Cecil on Friday last, and was in every way a distinct success. The arrangements made by the Executive Committee were admirable, and everything passed off most smoothly and satisfactorily. The company present numbered about 640, practically the same total as at the Ball of 1925. Congratulations are due to the members of the Executive and the honorary secretaries.

Wages in Railway Power Stations.—At a meeting of representatives of the Electrical Trades Union, the National Union of Railwaymen, and the London railway companies held at the Ministry of Labour on Tuesday last, an agreement was arrived at in respect of the power-house men's claim for increased rates. The terms of settlement were not disclosed, but it was announced that there would be no strike.

Coal Resources Research.—In pursuance of the policy of the Department of Scientific and Industrial Research of carrying out the physical and chemical survey of the national coal resources, which is one of the main features of the fuel research work of the Department, a committee has been appointed to deal with the survey of the coalfields of Nottinghamshire and Derbyshire.

The Shannon Scheme.—Some additional technical details of the Shannon hydro-electric scheme are given in the *Irish Trade Journal*. A broad-gauge railway for the transport of materials is to be built from Longpavement Station to the site of the power house at Ardnacrusha, and a narrow-gauge railway is to be extended along the works from Longpavement to the end of the embankments near Killaloe for the delivery of materials and plant, and for transporting earth for the embankments.

The excavation work for the power house, tail and head races will be carried out by huge electrically-operated excavators supplied from a temporary Diesel-engine power station, and it is estimated that ten million tons of earth will be excavated. Most of the tail-race excavation will be in rock. The power house will be of concrete construction comprising the dam, turbine house, and generator and switch house. For conducting the water to the turbines steel penstocks, 140 ft. long and 20 ft. in diameter are to be employed. Three 30,000-h.p. turbine and generator sets will be initially installed. In the partial-development stage the head-race channel will be about 260 ft. wide at the water level, 100 ft. wide at bottom, and 30 ft. deep; it will be capable of delivering 550 cubic metres of water per second with an average speed of 1.5 metres per second. The weir above O'Brien's Bridge will be of concrete with six sluice openings. Two of these will have a sill level 28 ft. below the high-level surface, and will be capable of discharging 34,000 cusecs., and the other four will have a sill level 10 ft. below high-water level, and will be capable of discharging 15,000 cusecs. Inlet works will be constructed at the entrance to the head race above the weir, and will consist of concrete foundations and piers with three wide sluice openings and one ship's gate. By closing the sluices and ship's gates it will be possible to cut off the head race from the river should it be necessary to lower the water for purposes of inspection and repair.

Appointments Vacant.—Foreman jointer, for the Spenborough (Cleckheaton) U.D.C. electricity department. Showroom manager (£307) for the Burnley Corporation electricity department. Junior assistant engineer for the Corporation of Ealing electricity supply department. Shift charge engineer, for the Watford Corporation electricity department. (See our advertisement pages to-day.)

An "All-Electric" Comparison.—The following interesting figures show the costs for a period of 12 months of two houses, one using electricity only and the other using electricity, gas, and coal for all domestic services, on the Sheffield electricity supply undertaking's system. All-electric house: Fixed charge, 10 per cent. of rateable value, £3; energy consumed, 7,647 kWh at 0.5d. per kWh, £15 18s. 8d.; plus 20 per cent., £3 15s. 9d.; total cost £22 14s. 5d., averaging 0.7d. per kWh. Electric, gas, and coal house: Electricity for lighting, 223 kWh at 4d. per kWh, plus 10 per cent. and meter rent, £4 11s. 4d.; gas for cooking, 18,700 cu. ft., £2 18s. 6d.; coal for heating, cooking and hot water (10 tons 2 cwt.), £20 8s. 5d.; total cost £27 18s. 3d.

The figures for the all-electric house, the rateable value of which was £30, represent the costs for the 12 months ending June, 1925, and the electricity, gas and coal figures for the other house, rateable value £24, are the costs for the equal period ending December, 1924.

Fatalities.—An inquiry was held recently into the cause of the accident when A. White and W. Merritt, linesmen employed by the G.P.O., who were working on a telephone pole, fell from a five-storey building on to the "live" railway line near Farringdon Street station, receiving fatal injuries. It was stated that one of the wire stays supporting the pole was perished with rust and that the pole was reported as being unsafe in 1923 and in 1925. A verdict of "Accidental death" was returned, the jury adding the following rider:—"The jury are unanimously of opinion that the renewal of the stays had been too long delayed."

Edward Brushwood, employed at the Stockwell sub-station, received a fatal electric shock on February 11th through some cause unknown. The current was cut off for about 20 minutes, and the L.C.C. tramway service between Brixton and Stockwell was brought to a standstill. An inquest was opened on Monday last, and was adjourned until Tuesday next.

Educational.—KING'S COLLEGE, LONDON.—Amongst the special advanced lectures which are being delivered in the Faculty of Engineering of London University, King's College, is a course of three on "Electrical Sub-stations: their Design and Operation," by Mr. H. Brazil, M.I.E.E. (engineer, City district, Charing Cross Electricity Supply Co.). In order to enable shift engineers and others to attend them, it has been arranged for the lectures to be given twice, as follows:—Lecture I was to be delivered on February 16th and 23rd; Lecture II will be delivered on March 2nd and 9th; and Lecture III on March 16th and 23rd. The fee to non-students is 10s. 6d. for the course.

E.D.A.'s Annual Dinner.—The annual dinner of the British Electrical Development Association is to be held on Friday, March 19th, at the Hotel Cecil, at 7 for 7.30 p.m. The speakers will be Viscount Burnham, C.H., Sir Laming Worthington-Evans, Bart., G.B.E., M.P. (Secretary of State for War), and others.

Harnessing the River Dee.—"The Utilisation of the Potential Resources of the River Dee" was the subject of a recent lecture by Mr. S. E. Britton, electrical engineer to the Chester Corporation, before the Chester Natural Science Society. He said that before water resources could be developed to the best advantage, radical alterations to the legislation which governed the use of water were needed, but before such changes were made, a national principle should be established, based upon a careful consideration of (*a*) the proprietorship of water, (*b*) the precedence of the various interests concerned in water, and (*c*) the character of existing restriction upon the free use and upon the abstraction of water for public and private purposes.

While straightening various bends in the river would assist in relieving floods, in improving the conditions of a particular length of the river for development of power and navigation, a further scheme suggested itself, *i.e.*, impounding some of the flood discharge by the construction of one or more dams across the upper valleys of the Dee or tributaries; the water so impounded could be made use of for a comprehensive water supply scheme, or it could be retained for the generation of power. From Llangollen to Erbistock, hydro-electric power stations could economically utilise the run-off water on 275 days per annum, and from Erbistock to Chester on 235 days per annum. As a result of surveys and levelling, it appeared that the water power of the Dee, between Chester and Llangollen, could be most economically harnessed for the generation of electrical energy by the erection of 16 weirs and hydro-electric installations. It was estimated that they would produce 60,000,000 kWh of electricity per annum. The capital cost of such a scheme would amount to £660,000 and would be capable of earning, by the sale of electricity, £198,000. The yearly working expenses, repayment, and interest on capital, spread over 25 years, would amount to £72,000, *i.e.*, an average cost of 0.288d. per kWh, leaving a profit of £126,000 per annum. The effect of impounding 6,250,000 gallons of water annually, which could not otherwise be economically used, and its discharge when there was a greater demand for electricity than the natural flow would produce, would generate approximately 20,000,000 kWh per annum, which, if sold at an average price of 1d. per kWh, would bring in £80,000, and would be sufficient to repay in ten years impounding works costing £600,000. The possibilities of this scheme for producing power were equivalent to the consumption of upwards of 70,000 tons of fuel per annum. The River Dee appeared to possess potential resources which, if developed in the interest of the common good, would provide water, electricity, and means of access, at a cost which would be a boon to industrial and domestic life, and give facilities and convenience of a magnitude which would surpass the most sanguine hopes of any scheme hitherto promoted. The hydro-electric works at Chester were completed in October, 1913, at a cost of £18,482. At April of last year water power at the weir had been converted into 19,640,000 kWh of electricity, the operating costs amounting to £8,659, an average cost of 0.1068d. per kWh. The annual repayments of the original cost of the scheme had amounted to £12,122, *i.e.*, an average cost of 0.1495d. per kWh; by the use of this water, approximately 38,900 tons of fuel had been conserved.

Birmingham and Midland Electrical Engineers' Ball.—It has been decided to hold the annual ball at the Grand Hotel, Grosvenor Suite, on Friday, November 19th, 1926.

Henley's Dramatic Club and the E.T.B.I.—We are pleased to announce that Henley's Dramatic Club, which has done so admirably during the last few seasons, has promised to give a performance in aid of the Electrical Trades Benevolent Institution. "If Four Walls Told," a village tale in three acts by Edward Percy, will be rendered at King George's Hall, Caroline Street, Great Russell Street, W.C.1, on Thursday, March 4th, at 8 p.m. The tickets will be 10s. 6d., 7s. 6d., 5s., and 3s., all numbered and reserved, and can be obtained from Mr. E. G. King, the Assistant Honorary Secretary, Electrical Trades Benevolent Institution, 98, Grosvenor Road, London, S.W.1.

The Electrical Power Engineers' Association.—At the annual dinner of the Scottish Division of the Electrical Power Engineers' Association at Edinburgh on Saturday last, Mr. F. Proudfoot presided over a company of 90, which included Mr. A. J. Ostler, president of the Association, Mr. R. B. Mitchell, city electrical engineer, Glasgow, and president I.M.E.A., and Mr. A. W. Crompton, of Newcastle.

Mr. E. Seddon, manager of Edinburgh Corporation Electricity Department, proposed the toast of the Association.

Mr. Ostler, who replied, said it was borne in on all technical men that they were really responsible for a great part of the management of modern life. That responsibility was growing every day.

Mr. Crompton, proposing "The Electricity Supply Industry," said the effect of putting into force the Government proposals would be to remove industry from the towns and spread it out throughout the country, and to do something to put agriculture on a better footing. Mr. Mitchell, in replying, said the one bright spot noted recently in the industrial situation was the increase in the exports of electrical goods. The lighting load throughout the country was increasing rapidly. In Glasgow the output for the months of November and December showed an increase over the same months of last year of 24 per cent. They were, he believed, on the eve of a development in industrial heating; he thought there was a remarkable future for that. If the Government electricity scheme was brought to fruition consumers in small, and even medium, undertakings would be able to buy their electricity cheaper than at present It would have a considerable effect on a large number of the members of that Association if over 400 stations had to be shut down; but these undertakings for the most part would be very small, and he hoped those members of the staff who were displaced would be absorbed—and he did not see why they should not very rapidly be absorbed—in the industry, which would go on from success to success.

Manchester Housing and Housekeeping Exhibition.—A Better Housing and Housekeeping Exhibition is being organised by the *Daily Dispatch* to be held at the City Exhibition Hall, Manchester, from April 9th to May 1st. One of the principal features will be an all-electric home equipped with the latest appliances.

Institution of Mining Electrical Engineers.—In a paper on "Mine Signalling Apparatus and Telephones," read before the London branch of the above Institution by Mr. O. D. Kennedy, the signalling requirements in mines, as laid down by the Coal Mines Act, are outlined and the modern methods and apparatus employed for signalling are reviewed. Varying methods of meeting the requirements of the Act are dealt with, together with the difficulties met with in that direction. In dealing with the advantages and disadvantages of mechanical and electrical signalling, the author said that the work of operating mechanical signals, especially from the bottom of a deep pit, was very hard compared with that of operating an electrical system, also a considerable amount of time was lost in giving the signal by the former method. The parts of a mechanically-operated visual indicator had to be made heavy to withstand the strain of the pull. The arrangement of interposing a switch on the pull wire to operate an electrical dial indicator introduced an element of danger; a signal might not be visually indicated through the pull being too short or the indicating device strained by too long a pull. With electrical signalling a perfectly satisfactory automatic arrangement could be obtained by installing special sending switches. The initial cost of the cable was much higher than that of the ropes required with the mechanical gear, but providing a first-class

quality of cable was obtained it should last for a very considerable period, and the saving in maintenance cost and the time in signalling would very quickly recover the initial outlay. When running a cable down the shaft the mistake was often made of not providing adequate fastenings. It was better to err on the other side, and to provide substantial cleats spaced not more than 60 feet apart throughout the length of the shaft so that the weight was well distributed and a minimum strain placed on the cable. It was an undoubted fact that the varying conditions at different collieries were better met by an electrically operated system of signalling, which was invariably more flexible than the mechanically operated systems.

Institution Notes.

Institution of Electrical Engineers.—At the informal meeting on February 8th Mr. R. J. Mitchell opened a discussion on "Some Modern Applications of Ball and Roller Bearings." He said the manufacture of precision bearings occupied the capital and energies of over 50 firms in Europe and America. The product of this considerable industry was a marvellous example of diversity and range, showing that in engineering there was no best way of achieving a result but that improvement in technique brought into being broad classes of competing types, all of which would have a fair trial in the field of hard use. Since loads on bearings supporting rotating shafts might be either pure journal loads or a combination of journal and axial loads, bearings must be designed to meet one or both conditions. To meet the requirements three broad classes of bearings had been developed—plain ball bearings, spherical double row ball bearings, and plain roller bearings. Many years of experience in the field of general engineering, and in particular in the automobile industries, confirmed that where properly applied the precision bearing left little or nothing to be desired in respect of performance. Some electrical engineers still hung back, however, when the decision had to be made between plain and precision bearings. By using precision bearings the designer was able to ensure not only a close air-gap, but that the air-gap would be uniform around the periphery of the rotor or armature and would remain so for the whole lifetime of the machine. Subsidiary advantages were that commutation was more reliable as chatter was impossible, whilst machines kept cleaner, ran cooler, started more easily, and were slightly more efficient on account of the reduced frictional losses. There were exhibited a number of ball and roller bearings, and Mr. Mitchell showed a quantity of excellent slides illustrating these in service. Mr. A. F. Harmer stressed the importance of clean lubricant, and said the cause of much bearing trouble was bad fitting. Mr. H. Brazil thought ball bearings were excellent on smaller machines. He wondered if the excellent results obtained on tramway motors would hold if the motors ran continually nine hours a day. Messrs. C. Belcher, C. S. Clark, W. A. Erlebach, C. R. Garrard, W. E. Rogers, — Smith, and W. L. Wreford also spoke.

Institute of Metals.—The annual and extraordinary general meetings will be held at the Institution of Mechanical Engineers on March 10th-11th, 1926. The annual general meeting will begin at 10 a.m. on the first day, and the extraordinary general meeting at that time on March 11th. The latter is being called for the purpose of passing a resolution to adopt a new set of articles of association, these being the "Regulations contained in the printed document to be submitted to the meeting." On March 10th the annual dinner of the institute will be held at the Trocadero Restaurant at 7.15 p.m. Among the papers which are expected to be submitted are:—"Some Experiments on the Soft-Soldering of Copper," by T. B. Crow; "The Influence of Gases on Copper at High Temperatures, Part 1," by A. Glynne Lobley and Douglas Jepson; and "The Die-Casting of Aluminium Alloys—A Review of Current Methods," by George Mortimer.

Institution of Heating and Ventilating Engineers.—In his presidential address before the above Institution, Mr. Oswald Stoll said some people thought that the science of heating and ventilating was not sufficiently advanced to be honoured as an art; hence arose what he believed was their greatest drawback. The designers and makers of a steam engine, steam turbine, or electric motor knew that they could buy material with which to manufacture those machines which bore a guarantee. Hence they were in a position to predict, from past experience, the results which would be obtained. The materials used in the construction of buildings varied considerably, and this fact made it much more difficult to obtain definite results. Their scientific knowledge and experience to-day had to be of a high order to enable them to overcome those initial difficulties and to produce the degree of accuracy which was expected. In a paper read before the Institution by Mr. H. G. Cathcart some useful figures as to the consumption of gas and electricity in different institutions were given.

Junior Institution of Engineers.—Mr. W. H. Patchell, M.Inst.C.E., took as the subject of the Honorary Member's Lecture which he delivered to the Institution on February 12th, his visit to some of the power stations in the United States in 1925. His remarks had, for the most part, reference to illustrations shown on the screen. He said that large power stations existed in the U.S.A. because conditions of supply were such that it paid all commercial firms and domestic households to use electricity. The demand was met because large plants were put down in the first place to save labour costs, and ever since that time the engineers had realised that in electricity they had something to sell. The result was that now, although 1921 was a bad year, the difference between kilowatts installed and kilowatts generated was doubling annually. Machines of 50,000-kW capacity were none too big when the load on one system varied by 60,000 kW between a dark day and a light day. It was remarkable that in Great Britain everybody waited for the Government to decide upon a standard frequency. What they did in America was to put in frequency changers, such as the 350,000-kVA machine at Brooklyn, and it paid to do so.

Mr. Patchell said that a comparison of British and American electricity prices was very hard to make, for the same reason that it was difficult even to compare the prices of everyday food. American charges might seem greatly different in different towns but that was because the unit charges were based on a standard rate which might be proportionate in one municipality, for example, to house frontage. The Americans certainly knew that a householder soon forgot his standard charge and appreciated the thought, when he saw his lights on, that they were costing only, say, twopence a unit and not eightpence.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

On Monday last Mr. F. A. B. Lord celebrated the completion of fifty years' connection with the hardware trade in the City of London. Mr. Lord began his career with the firm of W. F. Dennis & Co. when he was a boy, in 1876, and the whole of his fifty years' connection with the hardware, electrical and metal trades has been with that firm, of which he is now the head. In 1877 the firm became the agents in this country for Messrs. Felten & Guilleaume, and this arrangement continued down to the outbreak of war in 1914, when it was suspended until about a year after the cessation of hostilities; it was then resumed, and it remains in existence to-day. Mr. Lord's partners in the firm of W. F. Dennis & Co. are Messrs. J. E. Hood and L. H. Hurburgh.

Ing. FRANCESCO MANFREDI has resigned his position with the Società Lombarda per Distribuzione di Energia Elettrica in order to take up the appointment as Director General of the Milan municipal electricity undertaking and to supervise the construction of the new Valtellina power station.

Among the recent nominations as Chevaliers of the French Legion of Honour are M. DARDEAU, works director of the Paris underground electric railways and M. LEMON, director of the Société Force et Lumière des Pyrenees.

Mr. J. A. T. BARNES, manager of the Kendal Electricity Works, has informed the Corporation that he accepts an increase of salary to £450 per annum without prejudice to a revision of the matter later.

Mr. H. J. SMITH, resident engineer of the North Metropolitan Electric Power Supply Co. in the Hertford, Ware and Hoddesdon district, is leaving to take up a position with the Beds., Cambs. & Hunts. Electricity Co., and will be succeeded by Mr. C. R. MARSHALL, who has acted in a similar capacity at Chingford Mr. Smith was presented with an engraved casket by the staff on his departure.

Mr. E. F. DARKER, the London representative of the Benjamin Electric, Ltd., is shortly leaving for South Africa.

Upon leaving Dartmouth, in which district he has spent 24 years, Mr. G. E. SMITH, late engineer and manager of the Urban Electric Supply Co., has been presented by the Dartmouth staff with a pair of binoculars. He is taking up a position in London.

The marriage took place on February 11th, at St. Andrew's Church, Ashley Place, Westminster, of Mr. AUBREY LLEWELLYN COVENTRY FELL, C.B.E., of Ryestead Common, Chiddingfold, late general manager of the London County Council Tramways Department, and Miss FLORENCE RUBY WYNN, daughter of the late Mr. T. H. Wynn, of Middlesbrough.

Mr. JOHN L. GRIFFITHS, late of the Lancashire Dynamo and Motor Co., Ltd., Manchester, has been appointed assistant electrical engineer to the East Indian Railway, and is now stationed at Lillooah, E.I.R. (Bengal), India

The marriage took place at St. Thomas Cathedral, Bombay, on January 29th, of Mr. HAROLD WALTER PUTTICK, A.M.I.E.E., A.M.I.Mech.E., resident electrical engineer, Lillooah, East Indian Railway and Leigh-on-Sea, Essex, and Miss VIOLET WARING, of Aubrey House, Maida Hill, W.2.

Messrs. WALLIS-JONES & DENT have removed their offices to 9, Old Queen Street, Westminster, S.W.1. Their telephone number is unaltered: "Victoria 8070."

The *South African Engineer* states that Mr. ANDREW ROBERTS, elder son of Mr. John Roberts, M.I.E.E., borough electrical engineer at Durban, has obtained his degree of Bachelor of Science in Engineering at the Witwatersrand University, and has taken up an appointment with Messrs. Dougall & Munro, Ltd., engineers and contractors.

Obituary.—MR. J. STEPHENS.—The death of Mr. John Stephens, of Millwall, a brief reference to which appeared in our issue of February 5th, has removed from amongst us

another of the pioneers of the electrical industry. In the years 1883 to 1888, Mr. Stephens brought a great deal of knowledge and perseverance to bear upon the problem of making satisfactory lead castings for the plates of storage batteries. He was able, after many trials, to make chills in which to cast plates which were both light and strong. In association with the late Mr. Anthony Reckenzaun, he worked out details of a Very light, and what was at that time considered a very efficient, electric motor. Such motors were used for propelling battery driven tramcars and launches. An electric tramcar was built by the firm of Stephens, Smith & Co., of which Mr. John Stephens was the founder, and dispatched to Australia. The same firm built and equipped an electric locomotive for use in a mine, also several electrically propelled launches. One of these launches was supplied to the secretary of the Sultan of Turkey. Another electrically propelled boat was the *Volta*, which in September, 1886, successfully made the trip from Dover to Calais, and back to Dover, on one charge of the accumulators. Motor and equipment were all made by Mr. Stephens's firm. It is recalled that on this voyage a Solan goose, asleep on the sea, was seized by an occupant of the *Volta*, and brought alive to the shore, forming an illustration of the noiselessness of the vessel. Much other pioneer work was done by Mr. Stephens, and the industry owes much to his determination to solve difficult problems.

M. J. PERRETT.—The death is reported from Paris at the age of 56 years of M. Joseph Perrett, the chief engineer of the Société des Forges et Ateliers de Constructions Electriques de Jeumont. The deceased who was well known in the French electrical world commenced his career with the old Postel-Vinay concern, which was later absorbed by the French Thomson-Houston Co.

ING. GALLI.—We regret to learn from Milan that Ing. Galli, editor of the Italian electrical journal *Energia Elettrica*, has passed away.

MR. E. R. HILLS.—The death took place, on February 5th, at the age of 64 years, of Mr. Edward Robert Hills, St. Peter's, Broadstairs, who had for about 25 years been on the staff of the Isle of Thanet Electric Supply Co., Ltd.

MR. W. A. CAVE.—The death took place, on January 5th, at the age of 49 years, of Mr. William Alfred Cave, who had for 23 years been with the Marconi Co. at Chelmsford. For 15 years he was foreman of the Mounting Shop.

MR. J. R. CALDECOURT.—The death occurred on February 6th, at the age of 59 years, of Mr. John R. Caldecourt, who was in business as an electrical engineer in Station Road, Upminster, Essex.

MR. D. S. CAPPER.—We regret to learn of the death, which occurred on February 11th, at the age of 61 years, of Mr. D. S. Capper, who was for nearly 20 years Professor of Engineering at King's College.

Will.—The late Mr. ROBERT SUTTIE, a director of the Glenboig Union Fire-Clay Co., left £36,917.

New Companies Registered.

Certax, Ltd. (211,592).—Private company. Registered February 8th. Capital, £800 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in all kinds of electrical (wireless or otherwise) machinery, plant, apparatus, appliances and accessories, electricians, &c. The subscribers (each with one share) are:—W. A. Bourdon, 35, Mortlake Road, Ilford, clerk; A. E. Evans, 130, Thurleigh Road, Clapham Common, S.W.12, clerk. The first directors are to be appointed by the subscribers. Remuneration as fixed by the company. Solicitors: Timbrell & Deighton, 90, Cannon Street, E.C 4.

Radio Photographic, Ltd. (211,583).—Private company. Registered February 6th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and photographic apparatus, wireless photographers, &c. The directors are:—S. W. Chetwood, 1, Leopold Avenue, Wimbledon, S.W.19, dental surgeon; C. T. Millns, 16, Clyde Road, Croydon, certified accountant. Secretary: C. T. Millns. Solicitors: Guscotte, Wadham, Tickell & Co., 19, Essex Street, Strand, W.C. Registered office: 5, Lambeth Hill, Queen Victoria Street, E.C.4.

City of London Radio Corporation, Ltd. (211,537).—Private company. Registered February 5th. Capital, £1,000 in 700 10 per cent. non-cumulative preference shares of £1 each and 6,000 ordinary shares of 1s. each. The preference shares take priority for return of capital. Objects: To carry on the business of electrical engineers, manufacturers of, and dealers in wireless and electrical apparatus, machines, accessories, and goods, &c. The subscribers (each with one preference share) are:—R. O. G. Maxwell, 20, Pendarves Road, Raynes Park, S.W.20, traveller; W. Sanders, 3, Cranbrook Road, S.W.19, engineer. The first directors are to be appointed by the subscribers, and may (if so provided in their appointment), retain office for life or for a specified period. Remuneration, £25 each per annum. Solicitors: Lord & Co., 154, Bishopsgate, E.C.

Harko, Ltd. (211,630).—Private company. Registered February 9th. Capital, £500 in £1 shares. Object: To carry on the business of electricians, manufacturers of and dealers in radio apparatus, mechanical, electrical and radio engineers, manufacturers of and dealers in electrical appliances and apparatus, advertising contractors and agents, &c. The life directors are:—A. V. Mead, 4, Chandos Avenue, Chingford Road, Walthamstow, engineer; Dorothy Sheehan, 2, Macdonald Road, Walthamstow. Qualification, 10 shares. Solicitor: P. W. Pardy, 172, Bishopsgate, E.C. Registered office: 172, Bishopsgate, E.C.2.

Fraser Mares, Ltd. (211,629).—Private company. Registered February 9th. Capital, £1,500 in £1 shares. Objects: To carry on the business of electrical, radio and mechanical engineers, marine wireless engineers and contractors, manufacturers of and dealers in wireless apparatus, founders, metal workers, motor engineers and repairers, &c. The subscribers (each with one share) are:—H. Holmes, 98, Frederick Street, Cardiff, moulding manufacturer; A. H. Mares, 9, Waterloo Road, Cardiff, wireless engineer. The first directors are not named. Remuneration as fixed by the company. Secretary (*pro. tem.*): T. A. Tyrrell. Solicitors: Phœnix & Levinson, 8, Dumfries Place, Cardiff. Registered office: 27, Bute Street, Cardiff.

James Gray & Son, Ironmongers and Electricians, Ltd. (13,985).—Private company. Registered in Edinburgh on February 4th. Capital, £30,000 in 10,000 preference and 10,000 ordinary shares of £1 each. Objects: To acquire the business of general furnishing ironmongers, kitchen-range and grate makers and electrical engineers carried on by R. E. Douglas at 89 and 89a, George Street, Edinburgh, as "James Gray & Son." The directors are:—R. E. Douglas, 114, Polwarth Terrace, Edinburgh, ironmonger; A. J. Robertson, of "Stormont," 34, Morton Street, Joppa, ironmonger; J. C. Henderson, 97, Marchmont Road, Edinburgh, ironmonger; R. A. Douglas Elliott, 24, Merchiston Park, Edinburgh, ironmonger. Qualification, 250 shares. Registered office: 89, George Street, Edinburgh.

H. C. Brown, Ltd. (23,997).—Private company. Registered in Edinburgh February 11th. Capital, £1,000 in £1 shares. Objects:—To acquire the business of electrical engineers, motor-car and cycle accessories factors and agents carried on at Kirkwall by H. C. Brown and S. Banks as Brown & Banks. The first directors are:—H. C. Brown, 16, Bridge Street, Kirkwall, electrical engineer; J. J. Chedgey, 16, Bridge Street, Kirkwall, electrical engineer. Secretary: J. J. Chedgey. Registered office: 14, West Castle Street, Kirkwall.

Raphoe Electric Lighting Co., Ltd. (7,460).—Private company. Registered in Dublin on February 11th. Capital, £1,500 in £1 shares. Objects: To carry on the business indicated by the title. The directors are:—John Moffatt, Junr., Diamond, Raphoe, Co. Donegal, draper; Richard Hamilton, Diamond, Raphoe, Co. Donegal, provision and general merchant; Robert Thompson Whyte, Diamond, Raphoe, Co. Donegal, boot and shoe merchant; Hugh Carlin, John Craig, Dr. John English Snodgrass, all of Raphoe. Secretary: John Moffatt, Junr. Registered office: Diamond, Raphoe, Co. Donegal.

Official Returns of Electrical Companies.

Lisbon Electric Tramways, Ltd. (62,983).—Capital, £1,250,000 in 750,000 ordinary and 500,000 preference shares of £1 each. Return dated November 11th, 1925. 634,026 ordinary and 425,553 preference shares taken up. £134,026 paid on 134,026 ordinary shares. £925,553 considered as paid on 500,000 ordinary and 425,553 preference shares. Mortgages and charges, £466,300.

V. G. Middleton & Co., Ltd.—Satisfaction to the extent of £700 on December 31st, 1925, of debentures dated April 29th, 1920, securing £4,000.

Merthyr Electric Traction and Lighting Co., Ltd. ((57,908).—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5 each. Return dated June 18th (filed September 15th), 1925. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges, £48,400.

A. Behm (London), Ltd.—W. Strachan, of 50, Gresham Street, E.C.2, ceased to act as receiver or manager on February 3rd, 1926.

Thermal Electric Works (Hackbridge), Ltd.—D. Watson, of 88, Alexandra Road, East Croydon, engineer, was appointed receiver and manager on February 4th, 1926, under powers contained in debenture dated January 5th, 1925.

Isle of Thanet Electric Supply Co., Ltd.—Satisfaction to the extent of £1,384 on September 30th, 1925, of charges dated January 18th, 1902, and September 15th, 1924, each securing £150,000.

Specialities (Liverpool), Ltd.—Satisfaction in full by the payment of £360 7s. (the amount due) on October 29th, 1925, of charge dated January 26th, 1924, securing all moneys due or to become due not exceeding £1,000.

Sterling Telephone and Electric Co., Ltd.—Transfer dated January 25th, 1926, of mortgages dated May 15th and September 24th, 1924, securing all moneys due or to become due from the company to the Westminster Bank, Ltd., not exceeding £130,000, charged on all the freehold hereditaments to which the documents specified in the schedule to the mortgage of May 15th, 1924, relate, and the company's undertaking and property, present and future, including uncalled capital, if any.

H. G. Cooper, Ltd.—First mortgage debenture dated January 16th, 1926, to secure £5,000, charged on the company's undertaking and property, present and future, including unpaid capital. Holder: H. G. Cooper, Lawnrise, High Road, Laindon Hills, Essex.

Van Raden & Co., Ltd. (78,383).—Capital, £10,000 in £1 shares. Return dated November 30th, 1925. 6,754 shares taken up. £4,654 paid. £2,100 considered as paid. Mortgages and charges, £6,200.

Red Seal Products, Ltd.—Debenture dated February 3rd, 1926, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: L. Cohen, 39, Westgate Road, Newcastle-upon-Tyne.

L. Weekes (Luton), Ltd.—Particulars filed of £3,000 debentures authorised January 29th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

G. H. Turner & Co., Ltd.—P. M. Harper, of 329, High Holborn, W.C.1, incorporated accountant, ceased to act as receiver and manager on February 3rd, 1926.

G. Davenport (Wireless), Ltd.—M. G. Jemmett, of 30 and 32, Ludgate Hill, E.C.4, was appointed receiver and manager on January 29th, 1926, under powers contained in certain debentures dated August 14th, 1924.

Stearn Electric Co., Ltd.—Issue on January 25th, 1926, of £1,100 debentures, part of a series already registered.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Northampton Electric Light and Power Co., Ltd.

The net revenue account for the past year shows a balance on working of £53,564. To this are added £4,025 brought forward (after paying dividends up to December 31st, 1924), and interest amounting to £2,307, making £59,896. The allocations include £22,284 to the depreciation fund, £4,955 to the reserve fund, £1,000 to the battery suspense fund, and £1,000 to the employés' benevolent fund. The dividends on the ordinary shares total 9 per cent. for the year, as in 1924, and £8,327 is carried forward. Continued progress is reported; during the year the company commenced to supply energy to Daventry,

Weedon, Wolverton, Newport Pagnell, Olney and several villages. The maximum load increased by 26 per cent. to 8,498 kW, and the energy sold rose from 11,729,635 kWh to 14,278,101 kWh. Substantial price reductions were made during the year. The meeting was to be held yesterday (Thursday), and the shareholders were subsequently to be asked to sanction an increase of the company's capital to £500,000 by the creation of 150,000 additional "B" shares to be issued either as preference or ordinary shares.

The "Underground" Group.

The final dividends for the year ended December 31st last have been declared by the companies forming this group, as follows:—

London Electric Railway Co.—Ordinary shares: 1¾ per cent., making 3½ per cent. for the year, as compared with 4 per cent. for 1924. £45,000 is placed to reserve and £94,282 (against £74,506) is carried forward.

Metropolitan District Railway Co.—Ordinary stock: 1¾ per cent., making 3½ per cent. for the year, as for 1924. The reserve receives £45,000 and £51,347 is carried forward, as compared with £69,230 brought in.

City and South London Railway Co.—Consolidated ordinary stock: 1½ per cent., making 3 per cent. for the year, as against 4 per cent. for the preceding year. £25,000 is put to reserve and £25,037 is carried forward (as compared with £18,766).

Central London Railway Co.—Undivided and preferred ordinary stocks: 2 per cent., making 4 per cent. for the year, as in 1924. Deferred ordinary stock: 4 per cent. for the year (the same). £40,000 is transferred to reserve, and £81,008 (as against £85,885) is carried forward.

Underground Electric Railways Co. of London, Ltd.—It is proposed to pay the full interest and dividends on the 6 per cent. first cumulative income debenture stock and the 6 per cent. income bonds, as in 1924. The balance carried forward is £145,959, as compared with £126,685 brought in.

Metropolitan Railway Co.

The statement of accounts for the year ended December 31st, 1925, shows gross receipts of £1,998,979 (as compared with £2,264,040 in 1924), and an expenditure of £1,325,263, leaving a balance of £673,816. To this are added miscellaneous receipts of £306,107 and a balance of £51,127 brought forward, making £1,031,050. Preference dividends, interest, rentals, &c., absorb £600,910, and out of the balance (£430,140) dividends amounting to 5 per cent. are received by the ordinary shares, leaving £51,402 to be carried forward. In the preceding year the ordinary dividend was the same, but in addition £25,000 was placed to the general reserve fund. As we have already reported the dividend on the Surplus Lands Stock was raised from £3 7s. 6d. per cent. to £3 10s. per cent. The report states that the extension to Watford, constructed jointly with the London and North-Eastern Railway, was opened for traffic on November 2nd last. The reconstruction of the Aldgate and Edgware Road stations is in hand and is expected to be completed during this year. It is also hoped to complete new car sheds at Wembley Park to house ten trains of electric rolling stock. Following the ordinary meeting, which was to be held yesterday (Thursday), a further meeting was to be held to approve of the Metropolitan Railway Bill now before Parliament. This provides for the construction of a relief line connecting the Harrow extension line with the Circle line.

St. James' and Pall Mall Electric Light Co., Ltd.

The net profit for the year ended December 31st, 1925, was £67,907; to this is added £18,393 brought forward, making £86,300. The interim dividends absorbed £13,500, and it is proposed to deal with the balance (£72,800) as follows:—To employés' superannuation reserve, £25,000; final dividend on the 7 per cent. preference shares, £3,500; and a final dividend of 7s. 6d. per share and a bonus of 5s. per share on the ordinary shares, making a total distribution of 17½ per cent. for the year; leaving £19,300 to be carried forward. The report states that the connections increased from 24,073 kW to 26,631 kW and the amount of energy sold from 21,143,734 kWh to 23,650,969 kWh. Reference is made to the passing of the London Electricity (No. 2) Act which extends the tenure of the company and other companies until 1971 and regulates the dividends to be paid in future. The directors are taking the necessary steps to carry out the arrangements embodied in the Act. The extension of tenure enables the board to recommend the establishment of a superannuation fund for the employés. An extraordinary meeting for this purpose will follow the ordinary meeting which is to be held on March 2nd.

Central Electric Supply Co., Ltd.

After providing for sinking fund and depreciation the net balance for the past year is £5,001; £9 from the last account is added, making £5,010. A dividend of 5 per cent. upon the ordinary shares is recommended and a balance of £10 is carried forward. During the year the company supplied a total of 78,429,805 kWh to the following undertakings:—The Westminster Electric Supply Corporation Ltd the St. James & Pall Mall Electric Light Co., Ltd., the Chelsea Electricity Supply Co., Ltd., the Kensington and Knightsbridge Electric Lighting Co., Ltd., the Notting Hill Electric Lighting Co., Ltd., the Metropolitan Electric Supply Co., Ltd., and the St. Marylebone Borough Council.

Westminster Electric Supply Corporation, Ltd.

The balance of net revenue account for the past year, after providing for general reserve, depreciation fund, and other charges, is £172,801. Interim dividends absorbed £50,156, leaving a balance of £122,645, which it is proposed to allocate as follows:—Final dividend on the 4½ per cent. preference shares, £12,375; final dividend of 2s. per share (making 3s. for the year) upon the ordinary shares, £75,562; leaving £34,708 to be carried forward. The report makes reference to the reorganisation of London's electricity supply, and states that, owing to continued ill-health, Capt. Bax has resigned from the board and the directors have elected Mr. P. J. Hannon, M.P., to the vacancy.

Allgemeine Elektrizitäts Gesellschaft.

The report for the year ended September 30th, 1925, states that the brisk activity which started with the year slackened in the course of subsequent months. The invoiced sales showed an increase of 50 per cent. over the previous year, while the orders on hand represent an advance of 30 per cent. The net profits amounted to 8,363,000 marks as compared with 7,223,000 marks in 1923-24. The works were fully occupied until the middle of the year; but then the scarcity of capital and the uncertainty concerning the collection of payments falling due caused the directors to exercise great caution in the acceptance of orders and in demanding considerable sums on account. In the machinery works the number of types was reduced, and a particularly light type of electric motor was placed on the market. The large machine works delivered for Norwegian account four generators which were the largest hitherto made there. The steam turbine department was hampered through labour troubles at the beginning of 1925, this causing delays in deliveries. Present orders exceed those on hand a year ago, other countries taking a notable part in the orders. The department has under construction three 70,000-kW sets for the Rummelsburg power station, and it is stated that the total orders in the turbine works represent 750,000 kW. After referring to other central station work the report mentions that the company undertook the construction of high-pressure long-distance lines for various undertakings. Concerning the question of traction it is stated that business was brisk with regard to the covering of the requirements of the tramways in electrical equipment, but new orders for electric locomotives and motor cars declined. The future of the electrical industry is considered by the directors to be fairly promising. Whereas formerly 60 per cent. of the total turnover was disposed of in the home market and 40 per cent. abroad, the respective relationship is now 70 to 30. The reduction in the export percentage is attributed partly to protective tariffs abroad, unreasonable commercial policy, &c., although the hope is entertained that the pre-war percentage will be regained.

Swedish Company.—The *Allmanna Svenska Elektriska A.B. (A.S.E.A.)*, after having made provision for depreciation, reports net profits of 3,010,000 kr. for 1925, as compared with 2,030,000 kr. in the previous year, and the rate of the dividend rises from 2½ per cent. in 1924 to 4 per cent. last year. The favourable result is attributed to the expansion in export trade; Sweden increased her electrical exports from 17,500,000 kr. in 1924 to 21,000,000 kr. last year, and the chief share was obtained by the A.S.E.A.

Mersey Railway Co.—The accounts for the year ended December 31st last show receipts of £225,897, expenditure amounting to £146,914, and a net income of £88,767, to which is added £2,731 brought forward, and an additional sum in respect of mail contract of £4,702, making £96,000. After meeting interest, rentals, depreciation and renewal charges, &c., there remains a balance of £21,797. Out of this the directors propose to pay the full dividend on the 3 per cent. perpetual preference stock, leaving £2,325 to be carried forward. The report makes mention of Mersey Tunnel Bill promoted by the Liverpool and Birkenhead Corporations, and states that as the result of opposition the company secured the introduction of important conditions for its protection. The annual meeting was to be held yesterday (Thursday).

National Gas Engine Co., Ltd.—A net profit of £39,147 was earned during the past year; to this is added £13,247 brought forward, making £52,394. After paying the preference dividend, one of 4 per cent. is to be paid on the ordinary shares, leaving £16,394 to be carried forward. Meeting: February 23rd.

Mather & Platt, Ltd.—Dividend on the ordinary shares of 10 per cent. per annum, together with a bonus of 5 per cent., both free of tax, less interim dividend of 5 per cent. already paid, leaving to be carried forward to next account £178,281.

Torquay Tramways Co., Ltd.—Dividend of 4 per cent. and bonus of 1 per cent., both free of tax, on the ordinary shares.

County of London Electric Supply Co., Ltd.—Final dividend of 10 per cent. less income tax, on the ordinary shares, making 15 per cent. for the year.

South London Electric Supply Corporation, Ltd.—Final dividend of 10 per cent., less income tax, on the ordinary shares, making 15 per cent. for the year.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Enfield Cable Works.—47,944 new ordinary shares of £1 each, issued at £2 5s. per share, partly paid and fully paid, Nos. 202,057 to 250,000.

Oliver Pell Control.—74,411 ordinary shares of £1 each, fully paid, Nos. 1 to 74,411, 25,000 8 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 1 to 25,000.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—50,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,160,001 to 1,210,000; 42,137 new "B" ordinary shares of £1 each, fully paid, Nos. 687,864 to 650,000.

Reading Electric Supply Co., Ltd.—£150,000 6 per cent. first mortgage debenture stock, issued at 102½ per partly and fully paid.

Siemens Bros. & Co., Ltd.—500,000 new ordinary shares of £1 each, issued at £1 3s. per share, of which 13s. is payable on application and allotment, Nos. 1,500,001 to 2,000,000.

Application has been made to the Committee to allow the following to be officially quoted:—

Auckland Electric Power Board.—Scrip, fully paid, for £250,000 5 per cent. water power conversion and general extension purposes debentures, 1925.

Johnson & Phillips.—100,000 ordinary shares of £1 each, fully paid, Nos. 500,001 to 600,000.

Electrical and Industrial Investment Co., Ltd.—After meeting debenture interest, taxation and other charges, the net profit for 1925 was £17,300 and the addition of £29,440 brought forward makes £46,740. The following dividends have been declared:—6 per cent. on the cumulative preference shares; 7 per cent. on the preferred ordinary shares; and 6d. per share on the deferred ordinary shares. £31,490 is being carried forward.

Rushden and District Electric Supply Co., Ltd.—The balance on the revenue account for the past year was £4,293 and sundry additions give an available balance of £6,121. From this £500 has been transferred to reserve and £1,990 to the depreciation fund. A final dividend of 4½ per cent. is recommended, making 8 per cent., as in 1924. The energy sold rose by 32 per cent. to 1,131,691 kWh. The meeting was to be held yesterday (Thursday).

Montreal Light, Heat and Power, Consolidated.—The gross earnings for 1925 were $18,348,806, as compared with $17,394,091 in 1924, and the net revenue rose from $7,670,190 to $7,890,026. The working capital rose to $10,647,089, and the total assets from $86,354,148 to $88,914,498. A dividend at the rate of 7 per cent. was paid for the first quarter; for the other three quarters the rate was 8 per cent.

Pennsylvania Water and Power Co.—The total revenue for 1925 was $2,960,436, as compared with $2,686,466 in the preceding year. The surplus increased from $1,264,837 to $1,343,320. A dividend of 8 per cent. has been paid (as in 1924), and $220,850 has been transferred to the depreciation reserve, $100,000 to sinking fund reserve, and $140,000 to contingent fund, leaving $22,774 to be carried forward.

North Metropolitan Electric Power Supply Co.—The directors recommend the payment of dividends due on the preference capital and a dividend on the ordinary shares at the rate of 10 per cent. per annum for the year 1925, the same rate as last year. £150,000 is to be placed to reserve, compared with £132,718 for the previous year, leaving £6,675 to be carried forward, compared with £7,297 brought in.

Mansfield and District Tramways, Ltd.—The balance available in respect of 1925 (including £1,374 brought forward) is £16,408. A dividend of 2 per cent. (making 5 per cent. for the year) is recommended on the ordinary shares, and £1,148 is to be carried forward. Meeting: February 22nd.

Isle of Thanet Electric Supply Co., Ltd. — At an extraordinary general meeting on February 12th a resolution was passed sanctioning the creation of 140,000 shares of £1 each (increasing the capital to £500,000) and the issue of 72,000 of these as preference shares.

Charing Cross Electricity Supply Co., Ltd.—The directors recommend a final dividend on the ordinary shares of the West End Undertakings of the company at the rate of 1s. 6d. per share, making 3s. per share for 1925.

Mexico Tramways Co.—A half-year's interest is to be paid on the general consolidated first mortgage 50-year 5 per cent. gold bonds on and after March 1st.

London and Suburban Traction Co., Ltd.—The directors state that they are again unable to recommend the payment of a dividend on the 5 per cent. cumulative preference shares.

Telegraph Construction and Maintenance Co., Ltd.—A final dividend of 7½ per cent., free of tax, has been declared, making 10 per cent. for the year as in 1924.

Stocks and Shares.

MONDAY EVENING.

THE Stock Exchange settlement which falls due to be dealt with in the present week, while one of the smallest that has been handled for well over a year, is also likely to prove to be one of the most difficult. There was a good deal of undesirable gambling towards the end of 1925, and one result of the rubber share boom was the upbuilding of speculative accounts, both in rubber and in other shares. These take a good deal of money to finance now that the tide has definitely turned downwards, and prices in many markets are heavy. Investment stocks and shares are affected by the unfavourable elements in the speculative divisions, through the necessity which holders discover of selling good stock in order to meet their engagements. Moreover, just now, people are realising Stock Exchange securities in order to meet income tax demands.

There is, on the other hand, a good deal of absorbing power on the part of money, and new issues that come to market are taken without difficulty where they present reasonable attraction to the speculator or the speculative investor. Compared with three months ago, the volume of business being transacted in the Stock Exchange is barely a fifth to-day of what it was then.

Electricity supply companies are declaring their final dividends, and several important announcements have appeared during the past few days. In no case have these caused any change in prices. The Westminster pays 15 per cent. for last year, St. James' 17½, London 10, Charing Cross 15, North Metropolitan 10, Central Electric Supply 5, Smithfield 8 per cent. These are the same, in every case, as the rates paid for 1924. It is taken for granted that, in the light of these dividend announcements, all the companies are likely to maintain their previously-paid rates, and that there will be nothing to enthuse over in the 1925 dividends. Considering, however, the excellence of the latter, shareholders are not likely to feel any particular disappointment at a repetition of the previous rates From the market point of view, however, prices are tame, the only change of the week that is worth mentioning at all being a rise of 1s. 9d. in County of London ordinary to 60s. Yorkshires at 30s. 6d. are 6d. lower. Clyde Valleys lost a similar sum at 30s. Fife Tramways weakened to 22s., a drop of a florin, on the announcement of the dividend making 6 per cent. for the year as against 8 per cent. in the previous year. The falling off is due, the directors explain, not to a decline in profits, but to the situation that has arisen in connection with coal.

The Underground Electric Railways have declared their dividends, and Districts get the expected 3½ per cent. for last year. The figures of the group, however, are not particularly good. Central London deferred receives 4 per cent., as before; London Electrics 3½ per cent., as against 4 per cent. The City and South London 3 per cent. for 1925 compares with 4 per cent. in 1924. Underground Income Bonds have their full 6 per cent. tax free, the same rate as is paid on London General Omnibus stock. The allocations to reserve are about the same as they were, except that of the London General Omnibus Company, which has gone up £50,000 to £300,000. The Central London and the District reduce their carry forward; the other four companies increase their balances. The Metropolitan Railway carried 105 million passengers last year, a decrease of 13 millions: the average fare of 2.693d. is a little over a farthing per passenger less than that taken in 1924. The net receipts came out at £674,000, a reduction of about £120,000, but the dividend of 5 per cent. is maintained, as we have already indicated. On the week, Metropolitans are 10s. lower, and the Underground Electrics are also a little easier, the £10 shares giving way to 2¼ on selling, some of which came from Continental sources.

Siemens at 30s are ex rights to-day, Monday, and the price of the new preferences is quoted at 5s. 3d. premium. Telegraph Constructions are 10s. up at 29, and British Aluminiums at 38s. 9d. are 1s. 3d. to the good. The rest of the group leans to the dull side, with small declines in Brush, 28s., Electric Construction 33s. 9d., Henleys 3¾, Johnson & Phillips 27s. 6d. People are not taking the interest in this section that they were a few weeks ago, and in some directions shares have had to be sold on behalf of speculative purchasers who had to meet pressing liabilities incurred elsewhere. General Electrics can be sold at 31s. 6d., which is slightly better on balance.

The accounts of the Northampton Electric Light & Power Company show an expansion of £11,700, to £55,871, in the net revenue, and the directors propose to create 150,000 "B" shares of £1 each. This will raise the capital to half a million pounds sterling. The "B" shares last changed hands, some five weeks ago, at 32s. 6d. Victoria Falls ordinary shares are a good market at 49s., on the expectation that the company will benefit from a very comprehensive scheme of electrical development that has been arranged by the Union of South Africa. The Victoria Falls undertaking has four large power stations, and it is thought that these will be linked up with the Union Government's station at Witbank.

Wireless shares make an uninteresting display. There is hardly any active trade in them. Radio common are 9, the preference 9½. Canadian Marconi 4s. 6d., and the parent Marconis 25s.

London Traction issues maintain their recent improvements. Under the tightening hand of Traffic Control, it is assumed that the tramways will be afforded greater scope for profit-earning, if only from the fact that the L.C.C. and other important bodies have sunk too much money in trams for the systems to be treated with complete indifference. Consequently, according to this argument, something will have to be done to raise the business to a profit-producing plane once more. No dividend is to be paid in respect of last year upon London & Suburban Traction preference, which have had nothing since March, 1924. Foreign traction varieties are easier for choice. Mexican Light & Power preferred shares have gained 2 points better at 64½.

Cable stocks and shares exhibit a somewhat easier tendency. Globe ordinary fell back to 18¼. Automatic Telephones reacted to 51s. 3d., speculative interest in the shares having subsided for the time being. The rubber share market remains lumpish and is very disappointing to those who bought at the time when raw rubber soared to 4s. 8d. per lb. Its descent to 2s. 8d. per lb. has brought in a steady and continual stream of small selling, to counter which there is but little support, the result being, of course, that the daily disposition is for prices to sag.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923	Dividend. 1924.	Price Feb. 15, 1926.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	63/3	—	4 8 7
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	47/-	—	6 7 8
do. do. 4½ Pref.	1	4	4½	17/-	—	5 5 11
Chelsea	1	12	12	2¼	—	5 12 11
City of London	1	15	15	47/-	—	6 7 8
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—6d.	5 6 8
County of London	1	15	15	£0/-	+1/9	5 0
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	24/-	—	5 16 8
do. 7% Pref.	1	6	7	22/6	—	6 4 8
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	14¼	—	5 5 3
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	10	32/-	—	6 5 0
do. do. 6% Pref.	5	6	6	5⅛	—	5 7 10
Metropolitan	1	10	11	39/6	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	23/9	—	5 1 1
Newcastle-on-Tyne Ordinary	1	6	7	23/9	—	5 17 11
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/6	—	5 14 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	16¼	—	5 8 3
South London	1	15	15	2⅞	—	5 17 1
South Metropolitan Pref.	1	7	7	1⅛	—	5 6 8
Urban Ordinary	1	4	4	19/6	—	4 2 1
do. 6% Pref.	1	6	6	1	—	6 0 0
Westminster Ordinary	1	15	15	46/3	—	6 9 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/6	—6d.	5 4 11
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	69	—	5 16 0
Metropolitan	,,	4	5	68½	—½	7 6 0
do. District	,,	3½	3½	47½	—	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2¼	—¼	Nil
do. do. "A"	1/-	Nil	Nil	7/6	—	Nil
do. do. Income	Bonds	6	6	99	—	*6 1
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	102	—	5 17 8
do. Def.	,,	1½	1½	26¾	—¼	6 6 4
Automatic Telephone	1	3	6	51/3	—1/3	2 5 8
Chili Telephone	5	6	6	6⅛	+⅛	*3 17 8
Cuba Sub. Ord.	10	5	5	6⅝	—	7 8 2
Eastern Extension	10	10	10	18	—	*5 11 1
Eastern Tel. Ord.	Stock	10	10	176½	—1	*5 13 4
Globe Tel. and T. Ord.	10	10	10	18¼	—¼	*5 9 7
do. do. Pref.	10	6	6	11	—	5 8 4
Great Northern Tel.	10	22	22	32	—	6 17 6
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi		10	10	1¼	—	8 0 0
Marconi Marine	1	10	7½	⅞	—	8 11 6
Oriental Telephone Ord.	1	12	12	2¼	—	*5 12 11
United R. Plate Tel.	5	8	8	7½	—	5 2 7
Western Telegraph	10	10	10	17⅝	—	*5 11 11
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8½	—1/6	8 9 2
do. do. 2nd Pref.	5	6	6	9¼	—1/6	9 12 0
do. do. 5% Deb.	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord.	,,	6	6	117½	—	5 2 2
do. do. 6% Pref.	,,	6	6	106	—	5 13 2
Brazil Traction	100	4	4	93	—1	4 6 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	84½	—	5 18
do. do. Preferred	,,	96/-	96/-	103½	—	*4 12 0
do. do. Deferred	,,	129/5	129/5	128	—	*5 1
do. do. Deb.	,,	4¼	4¼	79	—	5 7
London & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	45	—½	8 17 10
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0
Mexican Light Common	100	Nil	Nil	32½	—	Nil
do. Pref.	100	Nil	Nil	64½	+2	Nil
do. 1st Bonds	—	5	5	69½	—	7 3 11
Yorkshire (West Riding)	1	5	—	17/6	—	5 14 3
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2¾	—	*4 11 5
British Aluminium Ord.	1	5	10	38/9	—1/3	5 0 2
British Elec. Transformer Pref.	1	Nil	7	20/9	—	6 14 11
British Insulated Ord.	1	15	15	3⅛	—	4 17 11
Brush Ord.	1	10	10	28/-	—9d.	7 2 10
Callenders	1	15	15	3¾	—	4 5 9
do. 6½% Pref.	1	6½	6½	22/6	—	5 15 7
Crompton Ord.	1	Nil	Nil	16/9	—	... ...
Edison-Swan	4/-	10	10	9/-	—	4 8 11
do. 5% Deb.	Stock	5	5	83	—	6 0 6
Electric Construction	1	10	10	33/9	—9d.	5 18 6
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	20/3	—	4 18 9
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
,, Ord.	1	5	7½	31/6	—	4 15 3
Henley	1	15	16	3¾	—⅛	4 8 3
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1½	—	*4 0 0
Johnson & Phillips	1	10	10	21½	—	3 8 3
Met.-Vickers, Ord.	1	8	8	27/6	—6d.	5 16
do. Pref.	2	8	8	2¾	—	6 14 9
Siemens Ord.	1	—	7½	33/- xr.	—6d.	5 0 0
Telegraph Construction	12	20	10	29	+½	*4 2 9

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only genera. and they may vary according to quantities and other circumstances.

	CHEMICALS, &c.	Price February 16th.	Fortnight's Inc. or dec.
a	Acid, Oxalic ... per lb.	5¾d.	-
a	Ammoniac, Sal ... per ton.	£60	-
a	Ammonia, Muriate (large crystal) ,,	£32	-
a	Bisulphide of Carbon ... ,,	...	...
a	Borax ... ,,	£15	...
a	Copper Sulphate ... ,,	£25 10s.	...
a	Potash, Chlorate ... per lb.	4d. to 4½d.	...
a	,, Perchlorate ... ,,	5½d.	...
a	Shellac ... per cwt.	£15 15s.	-
a	Sulphur, Commercial ... ,,	£9 10s.	...
a	,, Roll ... ,,	£9 10s.	-
a	Soda, Chlorate ... per lb.	3¾d. to 3¾d.	...
a	,, Crystals ... per ton.	£5 to £5 5s.	-
a	Sodium Bichromate, casks ... per lb.	4d.	...
	METALS, &c.		
b	Aluminium, Ingots ... per ton.	£120 to £125	...
b	,, Wire ... per lb.	1/9 to 2/6*	...
b	,, Sheet ... ,,	1/6 to 2/-	...
p	Babbitt's Metal and Anti-friction Metal—		
	Grade I ... per ton net.	£256	£6 inc.
	Grade II ... ,, ,,	£181	£4 inc.
	Grade III ... ,, ,,	£100	£2 inc.
c	Brass (rolled metal 2' to 12' basis) per lb.	9¼d.	...
c	,, Tubes (solid drawn) ... ,,	1/- to 1/0½	...
c	,, Wire, basis ... ... ,,	10¼d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1	...
c	,, Bars (best selected) ... per ton.	£90	...
c	,, Sheet ... ... ,,	£90	...
c	,, Rod ... ... ,,	£90	...
d	,, (Electrolytic) Bars ... ,,	£67 10s.	£2 inc.
d	,, ,, Sheets ... ,,	£144 10s.	...
a	,, ,, Wire Rods ,,	£77 10s.	£2 inc.
d	,, ,, H.C. Wire per lb.	9 1/16d.	1/16d. inc.
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	6/6	...
h	India-rubber, Para fine ... ... ,,	2/7	2d. dec.
l	Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£12	...
g	Lead, English pig ... ... ,,	£35 10s.	5/- dec.
g	Mercury ... ... per bot.	£14 15s. to £15	5/- dec.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up.	...
p	Phosphor Bronze, plain castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/2⅔	...
p	,, ,, wire ... ... ,,	1/3½	...
o	Platinum ... ... per oz.	£26	...
d	Silicium Bronze Wire ... ... per lb.	1/0½	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£286 to £287	£9 inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd,
r W. F. Dennis & Co.

Canadian Hydro-Electric Development.—*Reuter* states that the speech from the Throne at the opening of the Ontario Legislature referred to the development of hydro-electric power on the Ottawa River, which forms the natural boundary between Quebec and Ontario. The hope was expressed that an amicable arrangement would be made with Quebec, for an equal division of power. The speech also indicated that the Government would press for the development of power on the St. Lawrence River.

Electrical Association for Women.—A meeting is being held at the British Industries Fair, Birmingham, on February 23rd, at 2.30 p.m., with a view to inaugurating a Birmingham and District Branch of this Association. Mrs. G. Lawson will act as honorary secretary, and the branch has the support of Mr. Chattock, the city electrical engineer, and his department. At 3.30 p.m. on the same afternoon the party will be conducted around the Electrical Section of the British Industries Fair, and at 4.30 p.m. the Fair authorities will invite the party to tea, over which Lady Brooks (the late Lady Mayoress) will preside. Mr. G. S. Frances, of the B.E.A.M.A., will give a short talk on matters of electrical interest at the tea. The business meeting will be addressed by the London director, Miss C. Haslett. Those interested in the formation of the branch can obtain particulars from Mrs. Lawson at 19, Southam Road, Hall Green, Birmingham, or from the London Director, The Electrical Association for Women, 26, George Street, Hanover Square, London, W.1.

Electrical Progress in New Zealand.

Recent Power-Board Developments.

(From Our New Zealand Correspondent.)

AUTHORITY was recently given to the Auckland Electric Power Board to raise £650,000 for electrical-transmission purposes in its district. A scheme has been approved for the provision of electrical energy from the Arapuni project, and it is anticipated that the supply will be available in three years and will obviate the need for the present supply from the Hora Hora Rapids plant, recently taken over from the Waihi Goldmining Co., and that from the present steam plant at the King's Wharf. It was suggested at the time of the proposal of the scheme, about a year ago, that the requirements from Arapuni would be 15,000 kW, but this figure has been exceeded, and the demand is already over 18,000 kW.

£250,000 has just been raised for the installation of equipment at the various sub-stations. Part of the equipment will include three rotary converters, each of 2,000 kW capacity, to be erected at the King's-Wharf station, where the pressure will be reduced. 22,000-V switchgear will be required at this station, and five 22,000-volt cables will be laid underground between the Government sub-station at Penrose and the King's Wharf—a distance of seven miles. At the Penrose sub-station the existing 6,600-V switchgear, now being used in connection with the Hora Hora supply, will be replaced by apparatus of a heavier type, and a 6,600-kVA transformer bank will be installed to reduce the pressure. At the Beresford-Street station a second 2,000-kW rotary converter will be installed.

The work yet to be carried out in the Auckland Board's district, especially in the southern area, is held up temporarily on account of the non-arrival of supplies of material, due to the recent shipping strike. As soon as the shipments arrive, the Te Papapa, Mt. Albert and Point Chevalier sections of the scheme will be proceeded with, as well as the extensions of the city street-lighting scheme, which are to cost £30,000; and the additional city business and residential connections, estimated to cost another £22,000.

The change-over works outlined above will take about 15 months to complete, and other works under the extensions scheme will be completed as opportunity offers.

Although the work of installing an additional 20,000-kW of plant at the Lake-Coleridge undertaking is proceeding rapidly, the pace is apparently not fast enough for Christchurch's requirements. The normal load of the existing plant is 12,000 kW, and the peak load has reached the 14,000-kW mark. A few setbacks have been experienced. Recently a fall occurred in one of the tunnels and several men lost their lives; it was decided to divert the tunnel, and considerable time was thereby lost. Trouble was also experienced with the placing of the huge steel caisson in the lake bottom to the base of which the intake tunnel had been driven. The floating into position of the caisson and sinking it into the bed of the lake proved to be a work of rather delicate manipulation.

The extensions to the power house are almost completed, and the erection of the new pipe lines is being pushed ahead. New switchgear is in course of erection and additional gear is being assembled at the Addington sub-station. A second transmission line is being erected between Hororata, on the Lake-Christchurch line, and Timaru, and a further extension from Timaru to Oamaru is now under consideration. These lines will be used for the 11,000-V transmission contemplated in connection with the new works. The completion of the scheme will bring hydro-electric service within the reach of practically the whole of the Canterbury Province.

In the North Island the three main generating stations at Mangahao, Waikaremoana, and Arapuni, when completed, will be linked up as a major triangle, to provide in all some 240,000 kW when the full supply is available. From these stations 110,000-V lines convey the energy to the numerous sub-stations, whence it is distributed over 11,000-V lines to the local distributing agencies. Some 33 Power Boards act as middlemen in the supply of Government energy to the local consumers, each Board operating its own sub-station. Almost the same conditions apply in the South Island, the ultimate idea being to link up Lake Coleridge with other plants to be erected in a manner somewhat similar to that of the northern system.

It is interesting to note that the 11,000-V lines are built on double type hard-wood poles.

Work on the hydro-electric undertaking at Arapuni Rapids is proceeding, and is already ahead of the contract time in some portions. The construction of one of the main 110,000-V lines has been completed between Hamilton and Auckland, and over this a temporary supply of energy from the Hora Hora works is being transmitted. The 50,000-V line from Arapuni to Rotorua is now almost completed, and the extension of the Te Awamutu 50,000-V line to Hangatiki for the Waitomo Power Board is well under way.

The Arapuni scheme is the largest yet undertaken by the Government; it consists in diverting the waters of the Arapuni Gorge into its old river bed and thus utilising a fall of 165 ft. where the old bed returns to the present channel. The available flow is calculated as 5,300 cusecs, and the average load, with a 50 per cent. load factor, is 120,000 kW. The site of the power house is some 105 miles from the city of Auckland, where the greater portion of the energy generated will be consumed, but it is also in the heart of the Waikato country, where there are several growing towns and where the farming and dairying inhabitants will take a considerable quantity of energy. The Arapuni project is expected to be completed by the end of 1928.

The rapid growth of hydro-electricity in New Zealand can be gauged from the following facts. From a capital outlay of £9,566,589, a net profit of 1.31 per cent. was last year (financial) returnable to the 87 Power Boards operating on behalf of 930,980 people, or 70 per cent. of the entire population of the country. The number of consumers increased by over 20 per cent., and is now over 155,000. The working charges for the supply during the year were £780,826, capital charges £732,086, and the net profit for all the Boards £125,884. 34 Power Board districts have taken polls for the raising of loans, all of which were successful, and the total amount required is £9,372,074. The net profit, £125,884, is represented by a profit of £162,376 from 59 Boards, and a loss of £36,492 from 28 Boards. Most of the latter were in their first year's working.

The total length of power lines in the Dominion is now 6,200 miles, an increase of 215 per cent. since 1921, while of the 90,000 kW supplied, water and steam account for 94 per cent., gas 4 per cent., and oil 2 per cent. The increase in the supply available has risen by 24 per cent., and the farming community is increasingly utilising hydro-electric energy. A return shows that the number of milking machines in the Dominion has increased by over 5,000 during the year, bringing the total in use up to nearly 20,000. In one Power-Board district alone there are over 1,000 milking machines—a figure which approximates one machine to every three consumers in the district.

Electric cooking is also becoming increasingly popular; the increase in the number of cooking ranges installed last year was 1,526 in the Mangahao district alone, or three to every hundred persons. In some other districts the figure is as high as 5 per hundred. This figure would have been higher in all probability had it not been for the shortage of material on the market caused by the shipping hold-up.

Electrical Exports and Imports of Czecho-Slovakia.

Below is a statement of the quantities of electrical and allied material exported from and imported into Czecho-Slovakia in 1924, based on the recently-issued official statistics for that year. These statistics are now being issued on a new plan, and those for 1924 include goods exported or imported for improvement or repair, and also imported goods having undergone similar treatment. Figures for the previous year do not include such trade. They are, however, given below in order to afford a rough comparison, and notes or increases or decreases are added.

IMPORTS.

	1923. Kilogrammes.	1924. Kilogrammes.	Inc. or dec. Kilogrammes.
Electric lamp bulbs, glass—			
Total	6,000	24,000	+ 18,000
Electrical insulators (plain)—			
Total	27,000	64,000	+ 37,000
From Germany	24,000	59,000	+ 35,000
Dynamos and motors, transformers and converters weighing 25 kg. or less—			
Total	103,000	85,000	− 18,000
From Germany	74,000	58,000	− 16,000
,, Austria	19,000	17,000	− 2,000
,, Great Britain	3,000	1,000	− 2,000
Ditto, weighing from 25 kg. to 5 quintals—			
Total	363,000	323,000	− 40,000
From Germany	222,000	201,000	− 21,000
,, Austria	125,000	101,000	− 24,000
,, Switzerland	10,000	16,000	+ 6,000
Ditto, weighing from 5 quintals to 30 quintals—			
Total	288,000	205,000	− 83,000
From Austria	149,000	115,000	− 34,000
,, Germany	126,000	76,000	− 50,000
,, Switzerland	6,000	4,000	− 2,000
Ditto, weighing from 30 to 80 quintals—			
Total	134,000	91,000	− 43,000
From Germany	73,000	5,000	− 68,000
,, Austria	50,000	67,000	+ 17,000
,, Switzerland	11,000	12,000	+ 1,000
Ditto, weighing over 80 quintals—			
Total	213,000	331,000	+ 118,000
From Germany	118,000	80,000	− 38,000
,, Austria	95,000	207,000	+ 112,000
Telegraph and signalling apparatus—weighing 5 kg. or over—			
Total	14,000	17,000	+ 3,000
From Austria	8,000	12,000	+ 4,000
,, Germany	3,000	3,000	—
,, France	2,000	1,000	− 1,000
Ditto, weighing under 5 kg.—			
Total	2,000	6,000	+ 4,000
Telephones and microphones, weighing 5 kg. or over—			
Total	69,000	75,000	+ 6,000
From Austria	55,000	63,000	+ 8,000
,, Germany	12,000	11,000	− 1,000
Ditto, weighing under 5 kg.—			
Total	11,000	23,000	+ 12,000
Lightning arresters, weighing 5 kg. or over—			
Total	5,000	1,000	− 4,000
Ditto, weighing under 5 kg.—			
Total	1,000	1,000	—
Electrical measuring instruments, weighing 5 kg. or over—			
Total	59,000	61,000	+ 2,000
From Germany	41,000	45,000	+ 4,000
,, Switzerland	10,000	10,000	—
,, Austria	7,000	5,000	− 2,000
Ditto, weighing under 5 kg.—			
Total	143,000	83,000	− 60,000
From Germany	104,000	48,000	− 56,000
,, Austria	21,000	10,000	− 11,000
,, Switzerland	15,000	22,000	+ 7,000
Switchgear—			
Total	19,000	31,000	+ 12,000
Incandescent lamps, electric—			
Total	102,000	117,000	+ 15,000
From Germany	38,000	34,000	− 4,000
,, Hungary	28,000	34,000	+ 6,000
,, Austria	19,000	21,000	+ 2,000
,, Netherlands	16,000	26,000	+ 10,000
Electric lamp sockets—			
Total	16,000	13,000	− 3,000
From Germany	12,000	8,000	− 4,000
Regulators, resistances, &c.—			
Total	405,000	327,000	− 78,000
From Germany	250,000	174,000	− 76,000
,, Austria	138,000	112,000	− 26,000
,, Switzerland	7,000	11,000	+ 4,000
Cable and insulated wire, metal covered—			
Total	16,000	12,000	− 4,000
From Germany	9,000	4,000	− 5,000
,, Austria	6,000	5,000	− 1,000
,, Sweden	1,000	3,000	+ 2,000
Ditto, covered with paper or asbestos—			
Total	4,000	10,000	+ 6,000
Ditto, covered with rubber—			
Total	2,000	4,000	+ 2,000
Ditto, covered with asbestos, paper, rubber, &c.—			
Total	10,000	12,000	+ 2,000
From Austria	5,000	6,000	+ 1,000
,, Germany	4,000	5,000	+ 1,000
Accumulators—			
Total	43,000	18,000	− 25,000
From Austria	31,000	7,000	− 24,000
,, Germany	11,000	9,000	− 2,000
Electric light carbons—			
Total	19,000	24,000	+ 5,000
From Jugo-Slavia	—	137,000	+ 137,000
Electrodes—			
Total	367,000	517,000	+ 150,000
From Germany	301,000	379,000	+ 78,000
,, Austria	33,000	—	− 33,000
,, United States	25,000	—	− 25,000

EXPORTS.

	1923. Kilogrammes.	1924. Kilogrammes.	Inc. or dec. Kilogrammes.
Glass bulbs for electric lamps—			
Total	595,000	854,000	+ 259,000
To Hungary	515,000	729,000	+ 214,000
Electrical insulators—			
Total	510,000	1,233,000	+ 723,000
To Belgium	117,000	49,000	− 68,000
,, Austria	79,000	1,812,000	+1,733,000
,, Great Britain	65,000	434,000	+ 369,000
Electric dynamos and motors, transformers and converters, weighing 25 kg. or less—			
Total	2,000	4,000	+ 2,000
To Germany	700	2,000	+ 1,300
,, Austria	600	1,000	+ 400
,, Poland	300	100	− 200
Ditto, weighing from 25 kg. to 5 quintals—			
Total	76,000	102,000	+ 26,000
To Austria	27,000	16,000	− 11,000
,, Poland	19,000	5,000	− 14,000
,, Jugo-Slavia	10,000	12,000	+ 2,000
Ditto, weighing from 5 quintals to 30 quintals—			
Total	78,000	178,000	+ 100,000
To Hungary	18,000	15,000	− 3,000
,, Poland	10,000	8,000	− 2,000
,, Jugo-Slavia	10,000	19,000	+ 9,000
,, Italy	6,000	83,000	+ 77,000
Ditto, weighing from 30 to 80 quintals—			
Total	37,000	44,000	+ 7,000
To Switzerland	20,000	—	− 20,000
,, Austria	17,000	26,000	+ 9,000
Ditto, weighing over 80 quintals—			
Total	242,000	112,000	− 130,000
To Germany	75,000	10,000	− 65,000
,, Austria	65,000	28,000	− 37,000
,, Switzerland	45,000	—	− 45,000
,, Jugo-Slavia	32,000	—	− 32,000
,, Hungary	21,000	—	− 21,000
,, Poland	—	52,000	+ 52,000
Telephones, weighing under 5 kg.—			
Total	3,000	300	− 2,700
Electrical measuring instruments, weighing 5 kg. or over—			
Total	1,000	6,000	+ 5,000
Ditto, weighing under 5 kg.—			
Total	1,000	4,000	+ 3,000
Switchgear—			
Total	10,000	12,000	+ 2,000
To Brazil	2,500	—	− 2,500
,, Poland	2,000	1,000	− 1,000
,, Belgium	—	200	+ 200
,, Holland	600	700	+ 100
,, Jugo-Slavia	600	—	− 600
,, Austria	—	4,000	+ 4,000

	1923. Kilogrammes.	1924. Kilogrammes.	Inc. or dec. Kilogrammes.
Incandescent lamps—			
Total	210,000	249,000	+ 39,000
To United States	65,000	111,000	+ 46,000
,, Germany	33,000	16,000	− 17,000
,, Poland	32,000	14,000	− 18,000
Electric lamp sockets—			
Total	6,000	16,000	+ 10,000
To Austria	1,500	3,000	+ 1,500
Regulators, resistances, &c.—			
Total	65,000	155,000	+ 90,000
To Jugo-Slavia	39,000	8,000	− 31,000
,, Austria	6,000	43,000	+ 37,000
,, Germany	5,000	37,000	+ 32,000
Cable and insulated wire, metal covered—			
Total	82,000	70,000	− 12,000
To Belgium	45,000	16,000	− 29,000
,, Rumania	16,000	15,000	− 1,000
,, Poland	14,000	6,000	− 8,000
Ditto, covered with paper or asbestos—			
Total	8,000	5,000	− 3,000
To Bulgaria	3,000	—	− 3,000
,, Germany	2,000	200	− 1,800
,, Rumania	—	4,000	+ 4,000
Ditto, covered with rubber—			
Total	4,000	1,000	− 3,000
To Rumania	4,000	—	− 4,000
Ditto, covered with asbestos, paper, rubber, &c.—			
Total	261,000	126,000	− 135,000
To Rumania	115,000	38,000	− 77,000
,, Jugo-Slavia	80,000	45,000	− 35,000
,, Poland	29,000	1,000	− 28,000
Accumulators—			
Total	3,000	14,000	+ 11,000
Electric light carbons—			
Total	25,000	1,000	− 24,000
To Bulgaria	12,500	—	− 12,500
,, Great Britain	12,500	—	− 12,500
Electrodes—			
Total	41,000	1,000	− 40,000
To Germany	15,000	—	− 15,000
,, Holland	15,000	—	− 15,000
,, Austria	11,000	—	− 11,000

The Institution of Electrical Engineers.

Annual Dinner and Reunion.

THE annual dinner of the Institution of Electrical Engineers was held at the Hotel Cecil, London, on February 11th, the president, Mr. R. A. Chattock, city electrical engineer, Birmingham, being in the chair. That it is one of the most popular yearly functions is evident from the fact that the attendance grows larger each year; the diners numbered 586, and a most enjoyable evening was spent.

The King and members of the Royal Family having been toasted, "The Institution of Electrical Engineers" was proposed by the RIGHT HON. NEVILLE CHAMBERLAIN, Minister of Health, who pointed out the fact that the Institution membership was in excess of 12,000, and it was the largest Institution in the country. He knew of no other agent on behalf of which such extravagant claims had been made as electricity by a public whose enthusiasm was only equalled by its ignorance. It must be admitted, however, that electricity had no rival as a producer of light, and it had become the most popular form of power. The first sketch of the Government's scheme had been welcomed by the public with a unanimity which was positively alarming. The only thing which consoled him was that it was praised quite as much for what it did not do as for what it proposed to do. To begin with, there was to be no subsidy; that was quite a change, and no nationalisation—in fact, as little State interference as was compatible with the purposes they had in view. The Government's aim might be expressed under three heads—to provide for concentration of production, for the pooling of power reserves, and for the standardisation of equipment. If they could achieve those three objects, they might hope to see throughout the country, on the average, some considerable cheapening of electricity, and certainly a very much increased availability of supply. Purposes of that kind were worthy of a serious national effort, but, of course, changes of that kind could not be made without interfering with local and personal interests. There would be a certain amount of dislocation and change and the abolition of existing offices, but what they were after were changes in the national interest, and what benefited the community as a whole sooner or later must percolate to every individual part of it. In the carrying out of the proposals, after they had received Parliamentary sanction, the Government would look to that Institution for assistance, and he felt confident it would receive it.

Mr. R. A. CHATTOCK, President I.E.E., in responding, remarked that they were often told that they were still in their infancy, but they should reflect that they were now over 50 years old and held a position in the scientific world second to none. It was satisfactory to note the interest which members took in their Institution, but a question sometimes heard was: "What has the Institution done for me"? His reply to that was: "You are the Institution"; he had no patience for men who expected others to do for them what they could very well do for themselves. The Institution was willing and anxious to do everything it could to assist the Government to further the interests which the Institution represented. What ultimate changes the electrical age which they were now inaugurating would bring, he would be a bold seer who could prophesy. He was confident, however, that they were on the fringe of enormous developments.

Mr. W. B. WOODHOUSE toasted "Our Guests," saying that the presence of the president of the Royal Society (Sir E. Rutherford) reminded them of the dependance which they placed on the work of other Societies and he hoped they, too, found the work of electrical engineers useful. After reference to many of the distinguished guests, including representatives of a French kindred body (Mr. M. Leblanc, vice-president of the Société Francaise des Electricians) and of the I.C.E., he specially welcomed the representatives of the great Dominions for which manufacturers had a special regard. It was pleasing to mark the growth of exports of electrical machinery; 1924 was a record year and in 1925 some 25 per cent. had been added to the previous year's figure, which placed this country in the place of the biggest exporter of electrical machinery in the world. Perhaps the most striking index of their progress was the ardent desire of all political parties to foster so rosy a youth. He hoped new legislation would not disturb healthy and natural growth.

Sir A. STEEL-MAITLAND, Minister of Labour, in reply, said that the electrical industry at this moment, as he knew from the information which came to him every day, was one of the brightest spots in a picture which would otherwise be dark. He hoped it would continue to be bright and that the rest of the picture would become brighter to match it. There was hardly an institution which made itself felt more than the I.E.E., and that was because electrical engineers made up their minds about what they were going to say and then said it with one voice.

Sir LYNDEN MACASSEY, K.C., also responded to the toast.

A message of greeting from the Société Francaise des Electriciens was read by the president, and the British Imperial Orchestra played a selection of music during dinner and at the subsequent reunion in the Victoria Hall.

Illumination and Light.

The Faraday Lecture of the Institution of Electrical Engineers.

THE Faraday lecture on the subject of "Illumination and Light" was given by Mr. A. P. Trotter, before the members of the North-Western Centre and others, at the Manchester College of Technology, on January 19th. Mr. A. G. Ellis, chairman of the centre, presided; in opening the proceedings he said it was about 100 years since Michael Faraday took up the position of Director of the Laboratory of the Royal Institution, and about five years later he made his great discovery of electromagnetic induction. In optics, also, Faraday covered an immense field; he was one of the earliest seekers after the connection between electricity and magnetism and light, so the subject of the lecture was a very appropriate one in commemoration of Michael Faraday.

Mr. Trotter said he had been asked to speak about something which had been a hobby of his for some 45 years.

During the last 15 years a branch of engineering had developed which had for its object the study of the application of light, natural or artificial, for the use and convenience of man.

The Illuminating Engineering Society had been formed in recent years for the study and development of this subject; if it had done nothing more than collect statistics of the amount of illumination necessary for different purposes—houses, factories, schools, public buildings—it would have done good work, but in fact it had accomplished much more. The subject of "glare" had also received attention from illuminating engineers. Examples of it were easily found. A motor-car with headlights, on a dark night in a country road, gave an absolutely blinding glare, but the very same lamps, in the same car, would be hardly perceptible in bright sunshine. It was purely a matter of contrast, not of intensity of light. Although far more light was present in the latter case, it was much less dazzling.

The amount of illumination required for different purposes had been studied; the minimum for good street lighting had been ascertained and illuminating engineers had long lists giving the amount of illumination which experience had shown to be necessary for domestic purposes, railway platforms, workshops, schools, &c. The Home Office had made most useful recommendations as to the amount of illumination required in workshops for various kinds of work, ranging from 3 foot-

candles for ordinary work to a much higher figure in special cases, and no compulsion had been necessary to enforce those recommendations. Factory managers were becoming aware that accidents were reduced and the quality and quantum of the output were improved where there was light. The improvement was not only in higher candle-power, but also in the judicious arrangement of lamps and reflectors for different classes of work.

Light was not supposed to have any relation to any other branch of physics until 1846, when it dawned upon Faraday that there was an irresistible suggestion of similarity between the lateral or side to side disturbances of magnetic lines of force and the movement of light.

There was strong reason to believe that light itself was some kind of electro-magnetic disturbance in the form of waves.

So far as was known, all these vibrations and disturbances—from X-rays to the longest waves used in wireless telegraphy—were of the same nature, consisting of electromagnetic vibrations in a medium called "ether." Ether remained a speculative hypothesis; all that was asked of it was that it should vibrate; it was assumed that it had inertia or mass and that it was elastic and had absolutely unbroken continuity. Einstein said he had no objection to ether, his system being independent of it, but some of his followers declared that the hypothesis of ether was useless, unwanted, and unnecessary. Sir Oliver Lodge had replied that ether could not be dismissed as a mere negation; that a negative dogma was as bad as a positive one, but he distinctly said that it was not matter.

It was agreed that matter was composed of minute atoms which were formed of small particles called electrons rotating like planets round a central nucleus. Electrons varied in number in different atoms, and each electron had an orbit which it could change on impulsion; it might fly outwards or towards the centre. It was supposed that in doing so it liberated a certain amount of radiant energy. There was a mysterious limitation of the amount of energy so set free; the amount liberated at a time could be calculated. About 10 per cent. of the hitherto unexplained features of the spectrum, interference, the refraction of light, and other physical facts, might be accounted for in this way. Others could not be so explained, but appeared, as hitherto, to be fully explained by the ordinary undulatory wave theory of light. The discordance must be settled. The fact was that matter might have to be redefined. Our ideas of energy and matter were in the melting pot, and we must wait till they had been tried by the fire of mathematical analysis. Meanwhile it could be taken that there was nothing seriously wrong with the ordinary undulatory wave theory of light, but the complete theory was still unknown to the most eminent philosophers and mathematicians. A constructive theory of the nature of waves had been long overdue. As Sir Oliver Lodge had said, the end was not yet, and we should see common sense coming out of it. A new Faraday was wanted.

The lecture, which was illustrated with experiments, has been delivered also at Liverpool, Dublin and Cardiff, to large audiences.

Totally-Enclosed Switches and Fuses.

Messrs. Switchgear & Cowans New Ironclad Interlocked Unit-Type Gear.

THE service demanded from ironclad, unit-type, airbreak switchgear has become more strenuous and one of the advantages of the new design of Messrs. SWITCHGEAR & COWANS, LTD., is the fact that the hinge principle has been discarded. The new switch has been developed similarly to an oil-immersed circuit breaker, and has the advantages of a positive quick-make and quick-break reciprocating motion with two simultaneous breaks per pole.

In addition to accessibility the gear, as will be seen from fig. 1, is of very sturdy build; the two covers of the cast-iron cases of connected switches and fuses are interlocked by means of heavy lugs so that the fuse case can only be opened at the same time as the switch case, the switch then being "off" and the fuses "dead." The switch case cannot be opened when the switch is "on," neither can the switch be closed when the cover is open. Again, the top and bottom flanges of all cases of the same capacity are identical, which allows of the switch case being erected either on the top or bottom of the fuse case; it is therefore easy for the incoming "live" connections from the bus-bars to be made to the switch terminals and the outgoing cables to be so connected to the fuse terminals that the fuses can always be renewed in safety. Between each pole of the switches and fuses are arc barriers, dividing the cases into separate compartments for each pole or phase. The barriers are specially shaped to enable them to be easily removed and replaced. The moving copper contacts are held by a malleable-iron clamp at their centres where a tube of Bakelite surrounds each bar. The bars are mounted on a steel carrier to which the operating mechanism imparts a reciprocating motion. Hinges are thus dispensed with, and the bars can be removed with little trouble, each contact being entirely independent of the others, while the straight backward and forward movement of the contacts removes all torsional strain from the insulation.

The fixed copper contacts are of the bent-over spring type mounted on gun-metal bases. The two sets of upper and lower contacts are clamped by their bases to steel bars which are fastened to the back of the case. Between the ends, the bars are covered with a tube of Bakelite. The Bakelite tubes on these two bars and on each of the moving contact bars, are the only insulation on the switch. Both the upper and lower ends of the moving contacts make connection with corresponding fixed contacts, thus providing two simultaneous brakes per pole, and the terminals are right at the back of the case where they are not liable to be inadvertently touched. The operating gear is a simple lever-and-cam mechanism with spiral springs providing the quick-make and quick-break action, and is duplicated, the two sets being mounted inside the case at each end, with the operating spindle and moving contact carrier bar extending between them, imparting a reciprocating motion to the contact carrier bar, so that the pressure is evenly distributed and the alignment of the contacts is always maintained. The handle is free, except for the short time the catch is moving the cam and spindle round to open or close

Fig. 1.—Ironclad Triple-pole Switches and Fuses.

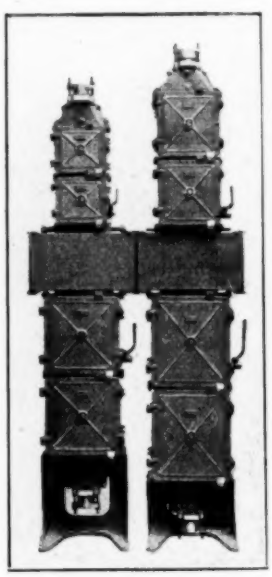

Fig. 2.—Unit-type Airbreak Switchgear.

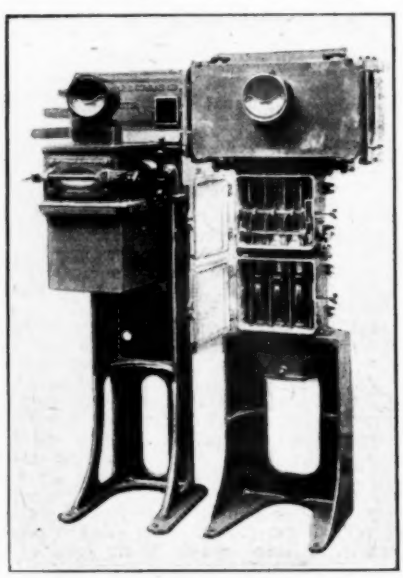

Fig. 3.—Combined Oil-immersed and Airbreak Pedestals.

the switch and the final opening and closing of the switch is done by springs; thus, a high speed is ensured independently of the speed at which the handle is moved by the operator. The switch is prevented from being operated when the cover is open by an interlock, nor can the moving contacts themselves be pushed in by hand. To comply with B.E.S.A. regulations, the interlock is arranged so that a competent and authorised examiner can operate the switch when the cover is open.

The S. & C. fuse carrier is said to be unbreakable; both the handle and fuse baffle are made of moulded insulating material, and, with the exception of the terminal screws, no small screws whatever are used in the construction of the carrier and contacts. The switchgear is made for either wall or floor mounting; cable boxes of any class, also pipe adaptors and instruments, are fitted when required. Various combinations of switches, fuses, and busbar chambers can be built up to form dust-tight ironclad switchboards of robust and pleasing design. When the current in any one circuit is in excess of 400 amps. an oil-immersed circuit breaker is used in place of the switches and fuses, as indicated in fig. 3. The switches and fuses are standardised in five sizes from 60 up to 400 amps., double and triple pole, for either a.c. or d.c. circuits up to 650 volts, and are successfully employed in many situations where conditions prevent the use of ordinary patterns.

Power Factor and Tariffs.

Types of Correction Plant, and a New Three-part Tariff.

(Abstract of paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.)

AT the February 4th meeting of the Institution, two papers on the above subject were presented. Mr. E. W. Dorey's contribution, which summarised the principal types of apparatus employed for the improvement of power factor, was abstracted last week, together with the subsequent discussion.* A résumé of the other paper was read by Mr. E. L. Hill, in the absence of the author in Australia; it contends that the wattless component of current, despite its having no energy content, involves the electricity supply undertaking in extra running costs, and that therefore a charge should be levied for supplying it as outlined below :—

A Three-part Tariff.

By E. V. CLARK, B.Sc., A.M.I.E.E.—*Abstract.*

THE great attention now being given to power factor suggests that the tariffs commonly used to-day are unsuitable in the present circumstances, which fact presents a paradox. In what other field of supply and demand are similar conditions possible? One cannot imagine a gas company imploring its satisfied consumers to adopt (for the benefit of the company and the supply generally) a type of engine which uses less gas. The point which lies at the root of the whole matter is the fact that an electricity supply undertaking is essentially a supplier of "electricity" and not merely of "power." A motor absorbs electricity and delivers mechanical power; the law of the conservation of energy tells us that a motor delivering so much brake-horse-power requires a certain minimum energy component in the electricity it consumes, in accordance with its inefficiency as a converter of energy; and in accordance with its inefficiency as a converter of electricity into energy, so it requires a wattless component in addition.

Extending the Hopkinson principle, one might suggest dividing to-day's cost of supplying electricity as follows :—

(*a*) The running costs involved in supplying the energy component of the electricity consumed.

(*b*) The running costs involved in supplying the wattless component of the electricity consumed.

(*c*) The standing charges incurred in being ready to supply the energy component of the maximum demand.

(*d*) The standing charges incurred in being ready to supply the wattless component of the maximum demand.

However, it seems quite impossible to frame a tariff which would differentiate adequately between standing charges on plant to supply energy and wattless component. To combine the two items (*c*) and (*d*) into one charge (based on kVA of peak load), though not strictly rational, is undoubtedly advisable. It would appear at first sight that a customer whose maximum demand is 1,000 kVA at 70 per cent. p.f. entails upon the supply undertaking somewhat less standing charges, *cæteris paribus*, than a customer whose maximum demand is 1,000 kVA at unity; but this is not necessarily the case, since diversity factor has a material influence and the diversity factor of the wattless component is, in general, much lower than that of the energy component. Combining (*c*) and (*d*) we arrive at a three-part tariff for the supply of a.c. power as follows :—

(i) A charge based on the kWh of energy used.

(ii) A charge based on the kVA-hours of wattless component used.

(iii) A charge based on the kVA of maximum demand.

With an appropriate tariff of this nature, the undertaking should gain by increased supply of electricity, no matter what the power factor. The use by consumers of the simplest and most reliable form of motor (the plain induction motor rated appreciably above its normal load) would no longer be a source of annoyance to the supply undertaking, but a direct gain; the onus of improving p.f. would be placed upon the consumer and the manufacturer's salesman. The suggestion that a low power factor should be a source of profit to a supply undertaking may appear revolutionary, but directly the wattless component is charged for at a price, however small, which covers its cost, its supply is no longer a disadvantage.†

An undertaking with an average p.f. of 95 per cent. supplies one kVA-hour of wattless component for every three units of energy supplied, and the economy in running costs secured by supplying at unity power factor would be barely perceptible. Yet where the average power factor is about 70 per cent., so that the kVA-hours of wattless component are equal to the kWh of energy, the total running cost of the wattless component is certainly much more than three times that in the former case.

The chief item in the actual running cost of wattless component is the increase in I^2R loss in generators, cables, and transformers. Upon a system of average p.f. (70 per cent.) whose layout is such that the units spent in these I^2R losses are 10 per cent. of the units generated, a saving of 5 per cent. of the units generated would be effected by abolishing all wattless current. Hence in a system such as this the running cost per kVA-hour of wattless component from this cause alone is about one-twentieth of the running cost per kWh. A second item is the extra generator excitation required to compensate, not only for the extra drop in the system, but also for the actual demagnetising effect of such wattless component. With a station of the above nature the order of this loss would be about 1 per cent. of the units generated. Another is the increased iron, friction, and windage losses in generators, &c., due to their being designed on a kVA basis; a direct increase in running costs may arise from wattless component being sufficient to require an extra turbo set to be operated (with reduced station efficiency) at times when the running turbine has not yet reached its limit of capacity, owing to the overloading of the alternator. Other disabilities lie in the greater complexity necessary to maintain a satisfactory pressure on the distribution system (since wattless component, as a rule, causes a larger drop than an equal current in phase) and in the increased difficulty it causes in effectively tying two distant stations; while the use of reactances to prevent disturbances in one part of a system from affecting other parts would be feasible to a much greater extent if wattless component were absent. In general, these disabilities have to be met by increased capital expenditure, and therefore increase standing charges rather than running costs. It is quite certain, however, that under heads such as these the supply undertakings incur running costs which could be avoided if wattless component were absent.

If, on a three-part tariff, standing charges are levied on the kVA of peak load irrespective of power factor, it is desirable that extra expense due essentially to wattless component should be regarded as running cost rather than as a standing charge, whenever any doubt occurs as to its allocation. The author suggests that for such a system as that cited above the total running cost per kVA-hour of wattless component is in the neighbourhood of 10 per cent. of the amount normally regarded as the running cost per kWh. In other words, an undertaking which at present operates on a two-part tariff of £z per annum of kVA peak load, plus 10y pence per kWh of energy supplied, might appropriately adopt a three-part tariff of £z per kVA of peak load, plus 9y pence per kWh of energy, plus y pence per kVA-hour of wattless component; or, more specifically, a two-part tariff of £5 per kVA demand, plus 0.5d. per kWh, might be replaced by a tariff of £5 per kVA demand, plus 0.45d. per kWh, plus 0.05d. per kVA-hour of

*ELEC. REV., Feb. 12th, 1926; pp. 270-272.

†Analogy: If it were the custom that sulphuric acid, whatever its degree of dilution, should be sold at a rate based solely on its acid content, on the ground that water is of too little value to be worth considering, then it would be to the advantage of sulphuric acid manufacturers to sell acid at that degree of concentration at which it was most cheaply made. It might pay them to keep a staff of men whose main duty was to urge customers to use strong acid, and to show them how strong acid might conveniently be used in their businesses. It would certainly pay manufacturers, while still charging on acid content, to allow a discount based on the degree of concentration of the acid required. But with the realisation that water, though practically valueless compared with acid, still costs something for distilling and for delivery, the manufacturer may frame a tariff based not merely on the acid content, but also on the water content of the dilute acid he is asked to supply. And with an appropriate tariff it will be more profitable to him to sell 100 tons of concentrated acid broken down to a specific gravity of 1.2 than 100 tons in the concentrated form.

wattless component; such a tariff might include any existing discount according to quantity, and sliding scale in accordance with price of coal, &c.

Assuming that this ratio of 9 : 1 is correct in the case of 70 per cent. p.f., the cost per kVA-hour of wattless component will be much less in the case of 95 per cent. and much greater in the case of 55 per cent.; this leads to an important difference between the assessment of the charge per kVA-hour on a three-part tariff and per kWh on a two-part tariff. In the latter case increased sales mean, in general, reduced costs of generation, and, consequently, it pays to assess the running costs per unit on a low basis in order to encourage the use of as great a number of units as possible. With wattless component, however, the opposite is the case; the tariff per kVA-hour of wattless component should be on the high side, tending to discourage, and an undertaking may with advantage assume an average power factor somewhat worse than that acutally existing. It should be profitable to allow for leading wattless component a bonus equal to the rate charged for lagging. Leading component taken by static condensers during the slack hours is on quite a different footing, and to levy no extra charge for out-of-phase current upon those customers whose p.f. is above 90 per cent. appears to be both illogical and impolitic.

Any form of charging for electricity which is confusing to the lay mind is intrinsically bad from the psychological standpoint, but the three-part tariff suffers from no undue trouble on this score, nor in most cases from difficulty in metering.

For measuring a single-phase supply on the three-part tariff one would require a maximum-demand kVA meter, an ordinary watt-hour meter, and a sine meter, *i.e.*, an ordinary watt-hour meter modified by introducing a time-lag of 90 deg. into the current or voltage. For three-phase work, similar meters of a three-phase type might be suggested, but in most cases a simpler form of metering may be used. The kVA-hours of wattless component will never exceed twice the kWh of energy consumed with any normal power user, and will rarely exceed it by 50 per cent.; whilst the rate charged will be of the order of one-tenth. It follows that an error of 5 per cent. in the measurement of kVA-hours is of less importance than an error of 1 per cent. in the measurement of kWh. Consequently, it will be quite sufficient to assume that the three-phase load is balanced, so far as the measurement of wattless component is concerned, and the sine meter need be nothing more than a simple single-phase watt-hour meter, the series coil being connected in one main and the pressure coil between the other two, the reading of such a meter on a balanced load giving $1/\sqrt{3}$ of the total kVA-hours of wattless lagging component taken, with a negative reading if the current is leading. The dial might read $\sqrt{3}$ times the actual consumption, so as to record the wattless kVA-hours of the three phases; or, alternatively, it might read "equivalent units," so that the wattless component recorded might be charged for at the same rate as the units of energy.

The sine meter, if it is allowed to reverse, gives full credit for leading current taken by condensers left in circuit all night; if provided with a pawl to prevent reversing, it fails to give credit for leading current taken at the time of load. However, there are ways of overcoming this defect, in the case of balanced loads, without introducing additional complications or requiring special meters, since two ordinary single-phase meters, their series coils being connected in two of the mains and their pressure coils thence to the third main, measure by the sum of their readings the total energy consumption, irrespective of any want of balance, while the difference between their readings gives the kVA-hours of wattless component, assuming balanced load, from the fact that the lagging wattless kVA-hours equal $\sqrt{3}(w_1 - w_2)$, or leading wattless kVA-hours equal $\sqrt{3}(w_2 - w_1)$, where w_1 and w_2 are the respective readings of the two meters. The use of two such meters involves little difficulty in computing the power bill from the meter readings, if the tariff is suitably quoted. Three methods may be devised, the following being probably the most satisfactory:—The tariff charges f_1 pence per unit for all units recorded, less a rebate of f_4 pence per unit for all units recorded on meter No. 2. (In this case $f_1 = x + \sqrt{3}y$, and $f_4 = 2\sqrt{3}y$.)

With two such meters, consumers get full benefit for leading power factor at the time of load, whilst a non-return pawl on No. 1 meter ensures that the consumer's rebate for leading current extends only down to a power factor of 0.5. However, if the units of energy do not constitute a rational basis for the electricity bill, it seems quite unnecessary to measure them, if one can provide a meter that will directly measure something else which gives a truer basis for computing the charge. By slight modification, a standard type of three-phase watt-hour meter is readily adapted to record, upon a balanced load, the kWh of energy consumed, plus or minus any desired fraction of the kVA-hours of lagging or leading wattless component consumed. That is to say, one may adopt a three-part tariff, using for those consumers whose load is reasonably balanced a maximum-demand kVA meter and an ordinary three-phase watt-hour meter, the latter being biased to read not in Board of Trade units, but in "virtual" units, to be charged for at a flat rate in accordance with the requirements of the proposed three-part tariff. The three-phase meter must comprise two single-phase armatures upon a common spindle, recording upon a common dial in the usual manner. The only modification necessary is to arrange that when one element is tested on single-phase current, the meter shall run a certain percentage fast, and that when the other element is similarly tested the meter shall run an equal percentage slow. If x per cent. fast and slow, we have a meter which, appropriately connected to a three-phase balanced load, measures accurately the kWh of energy consumed, plus $x/(100\sqrt{3})$ times the kVA-hours of lagging wattless component, minus $x/(100\sqrt{3})$ times the kVA-hours of leading wattless component. If the lagging wattless component costs (per kVA-hour) one-ninth as much as each kWh of energy, then $x = 19.2$ (that is, the two elevents of the meter are adjusted to run respectively 19.2 per cent. fast and slow) and by charging 0.45d. for all virtual units recorded, we are actually charging 0.45d. per unit of energy, plus 0.05d. per kVA-hour of lagging wattless component, less 0.05d. per kVA-hour of any leading wattless component.

The requisite bias may be given to a three-phase meter by designing the armatures or fields to have different strengths, by having different ballast resistances in their shunt circuits; or where current or pressure transformers are used, by having a different number of turns in the secondaries. Probably existing meters could be given the appropriate bias by so adjusting the brake as to make the meter run the required degree fast, and inserting an extra ballast resistance in the one shunt circuit. A non-return pawl is desirable to prevent the reversal of the meter under the effect of static condensers. The sanction of the Electricity Commissioners would be required before biased three-phase meters could be used, as they do not record the units of energy consumed, nor is it possible to deduce from their readings what has been the actual energy consumption, and therefore they do not comply with the requirements of the Electric Lighting Acts. Nevertheless, they measure the consumption of electricity on a balanced three-phase load on a perfectly definite basis, and their accuracy can readily be tested by testing each single-phase element separately. The determined charge for wattless component, however small, can be introduced with no expense save the initial one of altering the watt-hour meter installed. The consumer is not troubled by the addition of an extra meter that he does not understand, nor are his bills made up in any different form from that he is accustomed to, save that he is assessed in "virtual" units instead of in "Board of Trade" units. Any misgivings that he may have on that score will be largely alleviated by the fact that, while the number of virtual units recorded is not markedly greater than the Board of Trade units recorded hitherto, the price charged for them is 5 or 10 per cent. less. Indeed, for all power customers, large or small, except where the load is seriously out of balance, the biased meter should be quite satisfactory.

Electric Water Heating on Board Ship.—The internal-combustion engine-driven vessel *Belnor*, which has lately been completed by Sir W. G. Armstrong, Whitworth & Co. for Capt. Christen Smith, of Oslo, is of interest in that the water required for baths, &c., by the officers and crew is heated electrically by means of R-type storage geysers of the Bastian Meter Co., Ltd. (incorporating Bastian & Allen). The ship concerned is specially adapted for the transport of locomotives and has a dead-weight capacity of 4,100 tons. The type of geyser used consists of a tank to which the electric current is always switched on, thus giving 100 per cent. load factor, and at the same time a very small load. When hot water is drawn off, instead of the tank filling up immediately with cold water, it enters the tank at a rate proportional to the heating effect, and thus the remaining water is not lowered in temperature. It is only necessary to provide sufficient storage and a correctly-designed load to obtain a hot-water supply to meet all requirements that may be expected. In the case of the *Belnor*, two Bastian storage geysers are fitted. The one aft for the crew's use is of 100 gallons capacity, loaded at 2.8 kW, which, it is anticipated, will always be left on, and an extra heat of 1.2 kW for emergency. For the captain's requirements a 30-gallon geyser is provided with a continuous load of 450 watts. Thus for a continuous load of no more than 3.2 kW, the entire water heating for the crew and officers is provided. The geysers in question are rectangular, well lagged, and specially designed for ship work. To the best of our knowledge, this is the first sea-going ship which has a complete installation for water heating by electricity, and this has been followed up by an order for three other ships. Another point is the use of "Quartzalite" heating elements, designed to have a very long life, but when they do fail it is only a matter of a few minutes to replace them, and this can be done without in any way interfering with the installation.

Fuel Control in Italy.—In accordance with the replies to questions put by the Ministry of National Economy to the Commission appointed to deal with this matter last year, the Cabinet has approved of two bills of great importance. By the first, which provides for the control of fuel, the present associations of users of steam boilers are fused into a single body called the National Association for Fuel Control (Ente Nazionale per il Controllo della Combustione). The new association will exercise control over all apparatus and engines using fuel for any purpose with the view of enforcing the regulations suggested by the latest developments of technical science in order that the utilisation of fuel may be attended by as little waste as possible. New plant must fulfil all modern technical demands, and old apparatus and engines consuming large quantities of fuel and possessing a low degree of efficiency must be replaced within a reasonable length of time by modern apparatus and engines so as to realise the greatest economy possible. The second bill concerns measures for the better utilisation of home-produced fuels.—*Reuter's Trade Service* (Rome).

The Electrical Research Association.

Annual Meeting and Luncheon, and Report, 1920-1925.

The Luncheon.

On Friday last the annual general meeting of the British Electrical and Allied Industries Research Association was held in private, at the Savoy Hotel, London. An abstract of the report of the Council for the year 1925 was printed in our last issue (p. 264). Mr. Ll. B. Atkinson, chairman of the Council, occupied the chair, and it was learnt that he had been elected president of the Association.

After the loyal toast, Mr. R. A. Chattock proposed "The E.R.A.," congratulating the Association on its having passed the age of infancy and completed its fifth year. The work which it had done, he said, was very valuable and encouraging, covering all electrical interests and catering for the allied interests also. The inspectors appointed by the Research Department, who had reported so favourably, had pointed out that users derived great benefit from the Association's operations as well as manufacturers, and Mr. Chattock urged that they should share the expenses, seeing that they benefited financially from the work that was done. The Government offered further support if an extended programme was entered upon; the minimum requirements absorbed £16,000 a year, and additional funds should be provided.

So far the Association's work had been mainly electrical; as regarded the allied industries, a beginning had been made with condensers and turbines, and this work should be extended to include the corrosion of steam boilers; also the results obtained at power stations working on different systems should be collated and the most economical methods of operation deduced. The work done on poles for overhead lines would be useful in connection with the proposed national network; but the most valuable results were those obtained from the research on buried cables, by which large sums of money had been saved, which alone justified the support of the supply side of the industry. He wished all success to the Association, and paid a tribute to the ability of the director, Mr. E. B. Wedmore.

Mr. Ll. B. Atkinson, responding, recalled the formation of the Research Association, and said that agreements had been made under which the Association's supporters—mainly manufacturers—had guaranteed subscriptions, and the Department would assist them for the next five years, but on a reduced scale. At the end of that period the industry must provide for itself. Unfortunately, most people in this country were out of touch with science; little was taught in the schools, and the business world was recruited from the classes with a classical training. Business men had no individual knowledge of scientific method based on known facts and not on opinions; during the war science was called in, with astounding results, but afterwards the politicians fell back into their old ways. So the Government of this country, which was foremost in science, stood back from research and failed to realise what research could do for it. Did our countrymen realise that modern industrial and scientific knowledge was almost wholly the production of British effort? English agriculture was unrivalled throughout the world; in engineering our inventors led the world, and the locomotive, the railway, and the iron steamship were all British. The textile industries and the coal-gas industry were due to British inventors; in mathematics Napier, Newton, and Taylor, followed by Hamilton and Heaviside, laid the foundations, and navigation was made possible by Hadley's sextant and Harrison's chronometer. Optics, physiology and medicine, and surgery were revolutionised by Englishmen, and the secret of cancer recently yielded to British research. Chemistry owed the atomic theory, the production of sodium and potassium (and hence aluminium), benzole, and the aniline dyes to English researchers, and in electrical science, after the voltaic battery and the magnetic action of electric currents, almost every great discovery was British, up to the present day. Our fundamental discoveries had been developed by hundreds of brilliant workers in all lands, but the claim that every great step forward in modern science was a British product could not seriously be refuted.

It was unbelievable that any civilised State with such a record should have as its deliberate policy that it would not support research. The problem of employment in this country on the scale necessary to maintain the present population depended wholly on the finding of new products, new methods, new outlets. Within a few months the nation would have to find 20 millions to support the most backward industry in the country—a sum which, if applied to research, would almost certainly in a few years enable the production of coal to be abandoned for ever. Research associations and workers were not asking for charity—they were urging that the present squalid civilisation should be replaced, as it could be, by a far better one, if applied knowledge in every sphere was encouraged and developed. Instead of being a last charge upon the resources of the nation, research should be a first charge.

Mr. A. R. Everest proposed the health of the new president, expressing the indebtedness of the Association to him since, seven years ago, he was appointed to represent the I.E.E. on the Council of the Research Committee.

Mr. Atkinson, responding, said that no presidential office that he had occupied had given him greater pleasure and pride.

Report on the Work of the E.R.A.

In addition to the annual report above-mentioned, a report covering the work of the Association over the whole of its existence was recently issued. The report points out that prior to the formation of the Association, large sums were spent by individual manufacturers and others on research, but there was no provision for co-operative research. After recounting the events which led to the birth of the present Association, the report shows that there are important classes of work which can only be carried out in this way, and that the "E.R.A." has filled a recognised gap in the organisation of the industry. The results already obtained point clearly to the great possibilities of large-scale fundamental research. The research on oil circuit breakers has been marked by the production of revolutionary ideas which point the way to increasing rupturing capacity by hundreds per cent. Experience is showing that fundamental research in science is needed for the resolution of known problems. The standardisation of measurements and practice has produced material improvements in connection with insulating materials, as well as with switchgear, mining apparatus, and overhead line equipment; new and important data have been obtained by tests on a large scale of cables and overhead line equipment, leading to extensive revisions of practice and economy of materials. Revolutionary changes have been effected in some industries.

The Council of the Association is thoroughly representative of the electrical profession and industry, and all available facilities of research are used to the full, with the co-operation of the resources of individual members, the N.P.L., universities, polytechnics, other research associations, paper and silk manufacturers, public institutions, &c.; only in one section (electric control apparatus) is the experimental work done through its own staff, though 150 experts are engaged on committees in framing programmes and supervising researches. There are 13 sectional committees and 41 executive sub-committees. The report proceeds to review the numerous researches which have been and are in progress, indicating the nature of the results obtained, which in many instances are of a striking character. For example, insulating paper made to a specification based on the research work has shown better "ageing" properties than any previous sample; as great progress in the quality of asbestos products has been made in the last two years as in the preceding 20 years; ample supplies of insulating oil can now be obtained with an electric strength much above the tentative standard set up two years ago; the work done on the heating of buried cables is saving the country £250,000 to £300,000 a year; current practice in the design of "A" poles has been shown to be radically wrong; new data of great importance in oil circuit breaker design are constantly coming to light, and the breaking power of existing types will undoubtedly be increased many fold.

The report concludes with a schedule of researches in hand, a list of reports issued, lists of members of committees, members of the Association, &c.

Electric Bell-ringing.—It is hoped that before long "Great George," the 9¼-ton bell in the tower of the University of Bristol, will begin sounding the hours. It is interesting to learn that the mechanism which will actuate the bell was made in Bristol, Prof. David Robertson, head of the Electrical Engineering Department in the Engineering Faculty of the University, having designed the apparatus which is now being tested. It consists of an electric motor-driven striking machine to lift and drop the hammer; a time device to cause the former to function; a master pendulum to drive the time machine and electric clocks throughout the building; and the time signal apparatus to regulate the pendulum by means of time signals received from Greenwich over the Post Office lines. In the event of the failure of the public supply of electricity, the first stroke will be sounded only. The time machine and the master pendulum were made by Messrs. Brecknell, Munro and Rogers, Ltd., with some assistance from Messrs. G. Langford & Sons in connection with the fine work of the pendulum mechanism. The latter firm is also making the dial for the master clock, which will be in the same case as the time machine and pendulum, but as an independent mechanism driven electrically by one of Messrs. Gent's standard movements. The striking machine has been made by Messrs. Olver & Fry, and credit is due to all these firms for the way in which they have carried out tasks entirely outside their ordinary experience.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

Guy's Hospital Outfit.

Guy's Hospital has been added to the list of institutions that have been equipped with broadcast radio-receiving apparatus under the *Daily News* fund scheme. In this case arrangements have been made for 500 listening posts initially, the installation having been carried out by the Marconiphone Co., Ltd., and special provision has been made to simplify adjustments and general manipulation.

An indoor aerial is used, which is quite suitable for reception from London and Daventry, in conjunction with a long-range Marconiphone V2; the amplifying unit is of special design to suit the particular case and possesses a six-way output, making each distributing line independent of the others. Three stages of low-frequency coupling are used by means of transformers in conjunction with one Marconi D.E.5 and seven D.E.5A valves. Each of the latter serves about 100 points in parallel through a specially designed step-down "Ideal" transformer with a ratio of 5 to 1 to maintain an even electrical balance; attached thereto are 'phone sockets for testing the output of each line at the amplifier end of the lines, also special damping resistances are arranged in order to balance the output of each line to suit the load, or number of 'phones in circuit. The wiring throughout the system is composed of lead-covered cable, a wise precautionary measure which reduces the possibility of faults developing on the distributing lines. A six-way double-point fuse box, situated between the line transformers and 'phone lines, somewhat facilitates the testing of the lines and also acts as a safety factor.

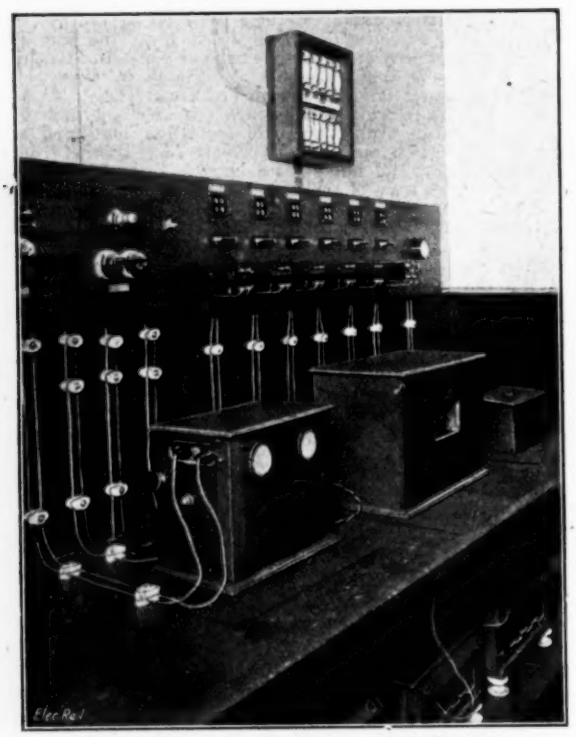

Fig. 1.—Marconiphone Installation at Guy's Hospital.

The high- and low-pressure supplies are obtained from a group of Exide accumulators, the former being composed of four 32-volt, 3-amp batteries, and the latter of 6-volt, 105-amp. cells. A pilot lamp has been installed as a guide, which glows when the set is in operation, and special battery-charging facilities are being arranged for by the Marconiphone Co.

The "Radiostar" Receiver.

The recently introduced 4-valve receiving set bearing the above name has been designed by the EDISON SWAN ELECTRIC CO., LTD., to supplement rather than supplant its "Radiophone" model. It is capable of dealing with all wave-lengths with the aid of a number of range blocks in the form of single plug-in coils. The lowest coil will give a range of from 60 to 200 metres, and the highest up to about 2,600 metres. Tuning by means of a calibrated dial is unusual in this country; the aerial-tuning condenser control comprises a celluloid dial on which a hair line is engraved, and a second dial of metal on which the names of the principal stations are engraved. The celluloid dial is rotated over the engraved dial, the hair line being set to the station required. The metal dial has three concentric circles: on the inner one figure the low wave-length ranges; the middle circle bears the names of the B.B.C. and other stations between 250 and 550 metres, and the outer circle those of long-wave stations, such as Daventry and Radio Paris. The double condensers provide a simple method of tuning on the short waves; separate filament-rheostats are provided of the dual type, for either dull or bright emitter valves, and a Dewar switch brings in either 2, 3, or 4 valves, while the current supply to the valves is controlled by a "pull and push" switch, which enables one to switch on or off without interfering with the settings of the rheostats. The instrument is enclosed in a polished walnut cabinet with hinged doors. All connections are made to terminals on an ebonite strip at the back of the receiver, batteries being housed inside the cabinet and the valves are also inside. The plug-in inductance coils have 6 pins, similar to valve pins, which fit into a special socket, and for control there are 2 main dials only, while it is necessary to change only one coil to alter the wave band.

The "Seamark Connode."

A novel combination of two-coil holder and variable condenser is manufactured in London for MESSRS. C. E. NEEDHAM AND BROS., LTD. As fig. 2 indicates, a projection on the lower ebonite end plate serves as the fixed coil holder, the moving holder being attached to a spindle that is concentric with, and passes through, the hollow spindle of the movable condenser vanes; a separate knob having a short extension handle operates the coil holder. The condenser is of the usual square-law pattern and a compact component of this type should be found very useful, as it facilitates the adjustment of reaction and capacity. The N.P.L., we understand, found the capacity between the movable plates and the fixed coil in its socket to be 3 micro-micro-farads, while in addition to its suitability for the broadcast and Daventry wave-lengths the device can be used for reception on waves down to 45 metres in length with a suitable circuit.

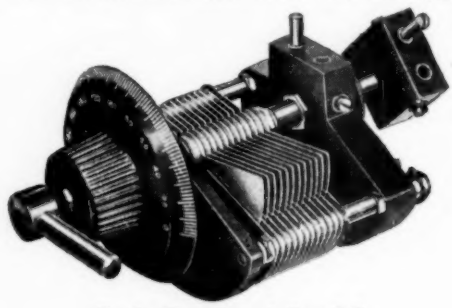

Fig. 2.—The "Seamark Connode."

Some Igranic Components.

Realising the advantages that should accrue from co-operation between British and American manufacturers of high-grade radio components, the Igranic Electric Co., Ltd., has concluded arrangements whereby, in addition to its present range of components, it has become the exclusive manufacturing licensee of the products of the Pacent Electric Co. Consequently, some of the accessories which are offered are worthy of special notice; for instance, the "Superaudioformer," shown in fig. 3, is claimed to amplify uniformly all frequencies from 100 to 8,000, and so to be unique amongst l.f. transformers. It is suitable for use with general purpose valves, particularly for power amplification, and the insulation is made to withstand plate voltages up to 500 V. Soldering tags and slotted hexagonal nuts are provided.

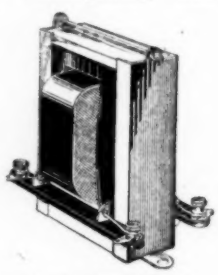

Fig. 3.—Igranic-Pacent "Superaudioformer."

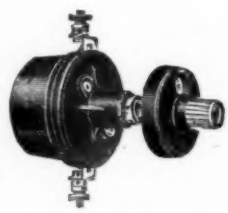

Fig. 4.—Tone Control and Damping Resistance.

A tone-controlling device and damping resistance is illustrated in fig. 4; its usual position is across the secondary winding of a l.f. transformer, but it may also be used to stabilise the h.f. portion of a receiver. In outward appearance it is exactly similar to the Igranic variable grid leak, 0-5 megohms, the resistance value in this case, however, being 0

to 1 megohm; it is suitable for use to cut down volume when receiving from a nearby station, obviating the necessity of mistuning the receiver, or dimming the amplifier filaments, so that the probability of interference and distortion which may be caused by resorting to these means is eliminated. For use as a damping resistance to increase stability in a valve receiver it may be connected in shunt with a tuned anode coil. It will be found reliable and constant in operation; the conducting parts are well separated from the control knob, thus eliminating hand-capacity effects, and single hole fixing is provided for.

The special feature of "Xllos" extra-low-loss coils (fig. 5) is the method by which adaptability in mounting is obtained. Precision wound, the coil is enclosed in a moulded Bakelite container, which excludes damp and dust. The contact pin

Fig. 5.—"Xllos" Low-loss Coil.

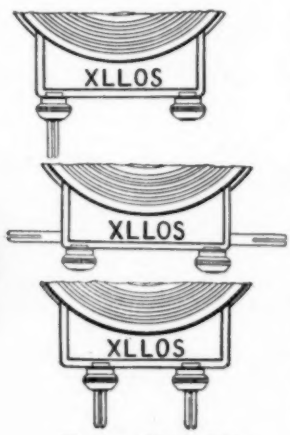

Fig. 6.—"Xllos" Coil; Methods of Mounting.

and socket, as indicated in fig. 6, are arranged to slide in slots formed in the moulded plug which is part of the Bakelite container. Thus the spacing between the plug and socket can be adjusted so that the coil may be used in standard holders, or they may be widely spaced for mounting the coil in a special low-capacity holder. The spacing is altered by loosening the milled ebonite nuts shown, and an extra pin is also supplied, which may be screwed into the socket to provide for double-pin mounting. It is thus evident that "Xllos" coils are valuable for experimental purposes; they are obtainable in six sizes.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The All-Electric House.

Electricity supply engineers should feel obliged to Mr. E. W. Dickinson and the Editors of the ELECTRICAL REVIEW for the article on "Fuel Economy and the All-Electric House."

I believe a coke-fired hot-water radiator system meets the constant requirements for warming that most recent milestone of progress, Electric House, Hackney. For comprehensive warming from a central boiler it is economical, effective, and hygienic—when properly installed.

But, quoting from the figures in the article, electricity with an effective 17 per cent. of the coal's c.v. beats gas with its 12½ per cent. on all counts without further argument.

I acknowledge the utility of the coke and all other products from the distillation of coal, but this need not, and, in my opinion, should not, necessitate the distribution of gas in a network of pipes. It is the gas which accompanies the electric cables down the streets—though not, be it noted, into the rural areas where heat, light, and power is badly needed.

The increasing use of electrical energy is automatically reducing the selling price of electricity to its correct level. Meanwhile, the astutely advertised solicitude of the gas industry for national fuel economy forms an appropriate recessional.

Invictus.

Wrexham, *February 9th*, 1926.

The interesting facts contributed by Mr. E. W. Dickinson would have served a wider purpose to electrical readers if the commercial values had been given for gas and coke in relation to B.th.u. from the distillation of coal.

The 1 lb. of coal with an average calorific value of 14,500 B.th.u.; am I right in assuming that 75 per cent. of the B.th.u. is still retained in the coke and gas in the proportion of 50 per cent. and 25 per cent. respectively? Also, what is the relation of the value of the gas, plus the coke, to the value when the same coal is used at the rate of 1.8 lb. per kWh, taking electricity at 1d. per unit, coke at 30s. per ton, and gas at 9d. per therm?

If we knew the weight of the coke per ton of coal used, it would be helpful.

Can we rely on the figure 50 per cent. efficiency for gas heating for domestic use? It would be helpful to many to give relative facts, especially in view of the exaggerated claims made by enthusiasts on both sides.

B. Gill.

Leicester, *February 9th*, 1926.

In an article on "Fuel Economy and the All-Electric House" in your issue of February 5th, the author presses the need for fuel economy in the production of domestic power; but should this aspect take precedence of other considerations?

It would appear that the greatest efforts should be made to secure the maximum possible comfort, convenience, and efficiency for the present and immediately future generations.

The author of the above-mentioned article, in common with others, admits that electricity can afford a standard of comfort in the home higher than that attainable by other means. All that the public requires is the best, and it will have it, provided that it can be obtained at a competitive price.

Turning now to the question of fuel conservation (with especial reference to fuel supplied for domestic purposes), various estimates have been made regarding the period for which our coal supplies will last at our present rate of consumption of coal, electricity, and gas. Consider the approximate figure of 150 years, which is probably on the low side; we find that if all our present output (of coal) were to be entirely absorbed by modern power stations, so that electricity only were used for all purposes, the overall heat efficiency when considering the useful output at the consumers' end of the power chain would be about 17 per cent., a figure that, for the present purpose, may be considered as approximating to that actually obtaining under the present system of supplying coal, electricity, and gas. Therefore, if we were to completely electrify, in the manner suggested above, our coal supply would still last for the 150 years. Now taking Mr. Dickinson's overall efficiency ratio regarding "all-electric" and "all gas and coke," we see that if instead of converting it into electricity, we converted our coal into gas and coke, the country's coal would last for something approaching 300 years.

We see, then, that if we use electricity exclusively, we shall be able to enjoy its benefits for 150 years, after which something drastic will have to be done; whereas, if we use gas exclusively, we have nearly 300 years to go before the discovery or development of other sources of power becomes imperative. Now in 150 years many things may happen, and one can reasonably assume that a radical change in our present-day fundamentally inefficient method of generation will occur, or else a practical source of power other than coal will be discovered. One must remember that "necessity is the mother of invention," and it is hardly to be thought that future generations will lack creative ability.

The point of view that I would suggest is:—Should we consider rather distantly future generations at the expense of the present, where the benefit resulting from such consideration will very probably never be needed by such generations? If we are able, on account of various economic conditions and peculiarities, to generate the best form of energy, *electricity*, at a *selling price* which compares favourably with the costs of other forms of energy—well, why shouldn't we? Why should we attempt to stay the tide of progress?

L. F. Ryland.

Manchester, *February 8th*, 1926.

I quite enjoyed Mr. E. E. Sharp's letter in your issue of the 12th. If it misses the point and leaves me cold, yet I still feel I can write something. There is a vast difference between sane enthusiasm found on fact and the uncontrolled variety fed on fancy and generally ending in trouble.

If my contribution on "The All-Electric House" means anything, it means that the electrical industry should not be blind to the good selling points of the products of its competitors, but should rather wake up and become supreme by manufacturing a cheaper and better means for providing heat in the home.

Curiously enough, on page 352 of the last issue of the ELECTRICAL REVIEW, there appears an article which describes an experiment on four houses of the six-roomed cottage variety, built by the Woolwich Borough Council under its housing scheme. The results show that with electricity at 1d. per unit the average cost of providing light, power, and heat to the four houses was £27 18s. 5d. per house for 13 months, or £25 15s. 5d. per annum, subject to a 20 per cent. rebate. Does Mr. Sharp consider that, out of a wage of £4 to £5 a week, this is a reasonable sum?

If the Borough Council could be persuaded, for experimental purposes, to install four more houses with electricity for lighting and power, and with gas and coke for cooking and heating, I think the results would show a very substantial saving probably amounting to 30 per cent. in cash paid out, with almost equal comfort in the house, and conserving the nation's source of energy.

I have by your courtesy seen the letters of "Invictus" and Mr. B. Gill. "Invictus" is at fault in assuming that the thermal efficiency—c.v. of coal to the c.v. usefully applied in the home—of gas and electricity is 12½ per cent. and 17 per cent. respectively. A little consideration will show him that the gas is obtained from the destruction of one-third of the coal,

while the 17 per cent. is from the whole. The true comparison is 37½ per cent. and 17 per cent. Mr. B. Gill is correct in assuming that 75 per cent. of the B.th.u. contained in the original coal is retained in the gas and coke in approximately the division of 25 per cent. and 50 per cent. His other query may be answered by means of a small table given below :—

HEAT IN THE HOME.

Source.	Unit of measure.	Cost in pence.	Cal. value of unit.	Use factor in home.	Resultant cal. value.
Electricity at 1d. per kWh	1 B.O.T. unit.	1·00	3,412	100%	3,412
Coke at 30/- per ton	1 lb.	0·16	11,000	35%	3,850
Gas at 8d. per therm	1 Therm.	8·00	100,000	50%	50,000

That is to say :—

(a) Electricity gives... ... ... 3,412 B.th.u. for...1d.

(b) Coke ... $\frac{5}{7}$ lb. = 2,406 } Gas ... $\frac{1}{50}$ therm = 1,000 } = 3,406 .. { 10d. / 16d. } = 26d.

On these assumptions electricity is much dearer than gas and coke for heating purposes.

Improvements in the generation, distribution and application of electricity will no doubt remove this disadvantage, but there is a vast field for improvement, and my only object is to disclose this field and make our industry absolutely impregnable.

E. W. Dickinson.

London, *February 13th*, 1926.

Sales and Prices.

The article on "Sales and Prices" in the ELECTRICAL REVIEW for February 5th represents a considerable amount of labour, but it may be doubted whether any really useful purpose is served by a comparison on this basis.

If a sufficient number of cases were taken to make sure that each group of points for each small range of sales represented about equal proportions of the same kinds of sales, the mean curve would have some significance. Such a mean curve is faintly indicated by the graph for sales between 1 and 20 million units, but the scattering of prices on each sales ordinate indicates that the number of cases taken is insufficient for any general deductions. For the graph between 20 and 200 million units the number of cases is altogether too small for any "law" to be indicated. The reason is that these larger undertakings differ enormously among themselves in the character of their sales.

"Units Sold" are not the same articles in different cases. The average prices are a compound of :—

(*a*) Prices at the factory (as for bulk and traction supplies metered at the station switchboard);

(*b*) Wholesale prices for deliveries to the retailer (as for bulk supplies metered at the end of suppliers' transmission lines);

(*c*) Retail prices for delivery at the consumers' premises in very varying amounts.

(*a*), (*b*), (*c*) are in very various proportions in different cases.

The retailer has often to carry out finishing processes—transformation and conversion—before he can deliver the retailed article.

The retailer has to provide, maintain, and operate the distributing system.

Two examples of London companies will illustrate how meaningless average prices against sales may be. They are all taken from the 1923 figures in the Commissioners' Report.

The Central Company generated 51.102 m. units, and sold 47.188 m. It generated 108 units for every 100 units sold.

Its three customers—the retailers—bought and generated 62.166 m. units and sold 51.365 m. They bought and generated 121 units for every 100 units sold.

The St. James & Pall Mall Company bought 99.9 per cent. of its generated and bought total; 125 units for every 100 units sold; so that the Central Company generated 135 units and sold 125 units for every 100 units sold by this retailer.

The Central Company had expended capital on distribution to the amount of £77,167, or £1,630 per million units sold.

Its three customers had spent £1,529,155 on distribution, or £29,770 per million units sold. Their expenditure on meters alone—£95,606—is greater than the whole distribution expenditure of the Central Company.

The City of London Company generated 51.997 m. units (not far from the 51.102 m. of the Central Company) and sold 42.606 m., or it generated 122 units for every 100 units sold.

Its expenditure for distribution capital was £1,121,825 (£109,959 for meters alone), or £26,330 per million units sold.

It is unnecessary to carry on the comparison to working expenses on distribution and accounting, or to do more than mention load factor.

The figures given demonstrate that any comparison between individual undertakings on the basis of sales against prices is without meaning, unless their sales are of the same character.

Henry M. Sayers.

London, *February 8th*, 1926.

[The necessity of making full allowance for local conditions was indicated in the article and in our leaderette. There was no suggestion that any "law" could be deduced from the data plotted; the diagrams, indeed, suggest a total absence of conformity to any law. One of their striking features is the fact that throughout the output scale both small and large power stations are found supplying electricity at an average price between 1.5d. and 2.0d. per kWh; another is that quite small stations can supply energy for less than 1.5d.

The fact that bulk supplies cost the retailer more than he pays the seller, on account of subsequent transformation and conversion, tells against the bulk seller's average price, which ought to be proportionately increased in order to be comparable with the prices charged by undertakings which supply energy ready for use, to which class the small stations belong.

That the London companies are working under exceptional conditions—and making exceptional profits—must be admitted. A loss of 35 out of 135 kWh generated, between the source and the consumer—more than 25 per cent.—within an area of a few square miles is rather startling.—EDS. ELEC. REV.]

Portable Apparatus in Bath Rooms.

In your leading article headed "Unusual Dangers," of February 12th, you, in common with your contemporary, the *Electrical Times*, express the opinion that "portable apparatus should never be used in a bath room." It puzzles me to think how the use of electrical apparatus in bath rooms will be avoided. In the first place, it is the most natural thing to have an electric radiator in the bath room. It is just the place where gas and coal are unsuitable and electricity is the only reasonable agent, and as it is not required there for long periods, it is, even at the present prices of electricity, a reasonably economical means of obtaining the desired comfort in the bath room.

Apart, however, from the electric radiator, I cannot help wondering how it is possible to prevent other portable electrical apparatus from being taken into a bath room, for example, hair driers, hair curlers, shaving-water heaters, towel rails, &c. Even if it can be understood in the industry that no wall plugs shall be fitted in the bath room, there is still the lamp socket to which small portable apparatus will be fixed. Moreover, there are portable appliances used in the household with long flexible cables, such, for example, as the vacuum cleaner, which will be brought into the bath room from plug connections in the hall, on the landing, or in other rooms.

I am apprehensive of electrical Press statements against the use of portable apparatus in the bath room, but if it must be done, then it should be done thoroughly, and all lay users of electricity should be warned. The usual way in "safety first" propaganda adopted in works is to draw up a scare notice showing realistically the disastrous results of carelessness. If your attitude is correct, the public should be warned in this way. Personally, I doubt very much if it is the correct attitude to take. The plan adopted in a factory for dealing with the same "unusual dangers" is to use a 3-core cable which includes a separate strand for earthing, and there must be visible terminals showing the earth wire connection.

Unfortunately, the risk of shock does not stop in the bath room. It applies in all parts of the house "where water or low-resistance earthing media are present." For example, a breakfast room is heated from a central heating system. It is a very likely occurrence for the electric toaster or electric kettle to be placed on the water radiator. In the scullery also, what is more natural than that the water tap should be held in one hand and the electric kettle in the other?—or even a cigar lighter may be hung up on a disused gas bracket. The rarity of fatal accidents proves the safety of electricity as compared with other domestic service agencies, but there must be innumerable occasions where the residents of a house obtain shocks which, to say the least, do not contribute to comfort in the home, and tend to scare persons off the use of electricity. Owing to the very large amount of exceedingly poor 2-wire flexible cables which are in use everywhere, it must be years before a satisfactory system can become universal. Why not let us try to get it started? A sound system of earthing the framework of all portable electrical apparatus is possible. Earthing terminals and wires can be substantially connected and locked in such a way that they will not work loose. Admittedly the practice is at present rare in domestic application, but is there any reason why it should not be propagated? The protected type of wall plug with a metal casing is now the common property of all manufacturers, it having been specified in all details essential for interchangeability and good earthing by a British Engineering Standards Association Panel, and I understand that the publication of the specification is not far distant. I feel that if our electrical Press would only advocate good workmanship, design, and good quality of material, that would be a better policy than to deprecate the use of electricity in one part of the house, which advice, if taken logically by the public, is likely to be detrimental to the general use of electricity in domestic service.

Is it too difficult a matter to attempt to educate the public into the observance of the principle of earthing all metal work which contains electrical elements? A start, of course, must be made with the average wiring contractor, who, I believe, to-day is very reluctant to attempt an "all-earthed" house wiring system.

I enclose a sketch in case I have not made my meaning clear as to the type of cable and earth contact. As with everything else, there is always some risk, however remote it may be, and this must be faced with an "all-earthed"

system. Good and visible terminal connections are merely a matter of good mechanics, in which men in this country do excel. The remaining risk is that the earth wire in the flex may be broken, and this, again, I believe, is mainly a matter for careful mechanical construction of the cable itself, and the gland and terminal fittings.

The principles involved are very much the same as those relating to the larger switchgear installations. At one time the "all-earthed" metal-clad systems were almost universally deprecated, but advance in the art and experience has proved their sterling merit, and now metal-cladding and earthing have become the recognised measures for safety. I can foresee that objections will be raised to the "all-earthed" electric house on the ground of increased cost. The same arguments were used against metal-clad switchgear. To-day it is known to effect economies in the cost of electrical installations, and so I believe the future will see a time, maybe 10, 20, or must it be 50 years hence, when our present methods of flimsy electrical connections in domestic service will be looked upon askance as relics of the courage and fortitude of the present age.

H. W. Clothier, Director,
For A. REYROLLE & Co., LTD.

Hebburn-on-Tyne, *February 13th*, 1926.

[We appreciate our correspondent's leaning towards earthed metal casings, with which he has been so successful on the larger scale, and we heartily approve of it in the case of fixed apparatus. We expressly said that in our opinion *portable* apparatus should not be used in bath rooms, and we emphasise the word portable because in the very next line to his quotation Mr. Clothier departs from the question by writing of "the use of electrical apparatus" without that word. Fix the radiator and earth it permanently and our case is satisfied. The same applies to shaving-water heaters and towel rails. Hair driers and curlers are more likely to be used in the bedroom, and, at any rate, not whilst one is in the bath, which is the danger spot (in every fatal case that we remember, the victim was in or on the bath). For the rest, we can only exclude wall-plugs and hope for the best; gas-heated geysers are still used in bath rooms, though people are killed by them every year. We included the scullery and cellar in our remarks. Elsewhere only hand to hand shocks are conceivably possible; a firm grip of opposite poles is most unlikely to occur, and with dry hands the risk of fatal shock from casual contact is too remote to require attention. "The rarity of fatal accidents proves the safety of electricity"; we know of no fatality in a living room or bedroom, hence there is no need to take elaborate precautions in such places.—EDS. ELEC. REV.]

An Electric Vehicle Association.

There appears to be a good deal to be said both for and against the formation of another association of those interested in electric vehicles.

Mr. R. J. Mitchell warns us again of the danger of having too many societies, and suggests that Mr. J. C. Elvy should join one of the existing societies. So far as I am aware, there is none wholly devoted to electric vehicles, nor any at present where members interested in such would not be entirely lost. It might be possible to get the Councils of the Electrical, Automobile, or Transport Institutions, for instance, to accept an electric vehicle paper once a year, or once in two years, but this is insufficient to allow users and makers to ventilate their opinions and get down to details. Most of us are aware that the discussion on an Institution paper extends to perhaps an hour and is usually very disappointing owing to limitations of time.

No doubt any meetings of a new Electric Vehicle Society would be very small, although probably more enthusiastic, and difficulty might arise in carrying on at all, as I know from experience. The Electric Vehicle Committee cannot invite all interested in this subject to join it, and we therefore arrive at suggesting some compromise to start with.

Why should not the Electric Vehicle Committee arrange meetings, with suitable papers and discussions, after its business meetings to cover all interested?

There need be no elaborate organisation, printing of proceedings, &c., to start with and the cost to such associate members, as they might be designated, would be only a nominal sum.

When the movement has grown, form the Institute if desirable and substitute a technical committee for the present Electric Vehicle Committee.

C. G. Conradi, M.I.Mech.E.

Otley, *February 9th*, 1926.

Battery-charging Equipment.

I should be glad if any readers of your pages could help me in a difficulty, as I have been unable to find anything capable of suiting my requirements, except at some extraordinary price, whereas it should be capable of a fairly cheap solution.

I wish to charge accumulators used for experimental purposes as follows:—

4, 6, 8, 10 or 14 volts at any rate from 1 ampere or upwards if possible—if higher so much the better, as, say, 5 amperes.

Then I also wish to charge 30-volt units at from ½ to a total of 1 ampere, this, of course, depending upon the number of units put on to charge in parallel.

The job must require a minimum of attention, be clean, free from objectionable noise, and not have a high upkeep charge. I don't wish to be compelled to purchase transformers, as I prefer to use my own, as I can then alter the tappings to suit, and if alterations are required later they can be made. I don't want any fancy cases—it is for experimental work, and I can house it to suit myself.

I should much appreciate any help offered, and if the a.c. voltages required to suit my requirements were stated for the apparatus recommended, it would further help.

It appears that experimenters are not catered for in this respect.

E. J. Capper.

Sheffield, *February 11th*, 1926.

[Probably a good many readers would be glad to know where such apparatus could be obtained for experimental work, as distinguished from the high-class finished apparatus supplied to the public.—EDS. ELEC. REV.]

High-pressure Cables.

With reference to the letter on this subject, in your issue of the 5th inst., I do not know whether I can agree with Mr. Addenbrooke that the Pirelli cables are at the "commercial" stage, when, according to the *Electrical World* of June 20th, 1925, they cost £14,000 per mile of single cable!

Assuming this figure to be correct, one wonders whether the idea is to have enough margin in the price to enable the whole line to be duplicated, and the pressure lowered, should it be found unworkable to operate at the pressure proposed; or whether the new system is so terribly expensive that it could not be put in for less money.

The work could probably be done with 30,000-volt cables at the price quoted, were it not for limitations in the size and number of conduits available.

A. M. Taylor.

Birmingham, *February, 13th*, 1926.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Bristol Electricity Scheme.—On February 8th, Colonel WOODCOCK asked the Minister of Transport whether permission had been granted for the city of Bristol to proceed with a new power station at Portishead before the Bill sanctioning the undertaking had been before the House.

Colonel ASHLEY replied that he was informed by the Electricity Commissioners that no decision on the Corporation's application had yet been reached.

Severn Barrage Scheme.—On February 8th, Colonel W. ASHLEY informed Colonel Woodcock that no expenditure had been incurred to date by the Ministry of Transport in connection with the Severn barrage scheme, but the estimated total expenditure on the further stage of investigation now about to be carried out was £28,875. The expenditure was being spread over two years, and it was impossible to estimate the cost of any further investigations before those now proposed were completed.

Heavy Oil Engines. — On February 8th, Sir V. WARRENDER asked the Prime Minister whether his attention had been drawn to the British Standard Specifications which had been prepared by the British Engineering Standards Association, and in particular to that for heavy oil engines in connection with electrical plant or otherwise; and whether Government departments would be directed to use this specification for their inquiries.

Mr. A. M. SAMUEL, who replied, said he had no doubt that the Government Departments concerned would in appropriate cases, make use of the work of the Association.

The Government's Electricity Scheme.—On February 9th, Col. ASHLEY, in reply to Mr. Day, who asked if, in framing his electrical power proposals, he would consider what legislative provision would be necessary to ensure that power cheaply generated under the Government electricity scheme would be as cheaply distributed to consumers by supply undertakings enjoying local monopolies; and whether, with that object, the consumer would be directly represented on the central authority to be set up under that scheme, said that the question had not been overlooked.

The Wireless Dispute. — On February 6th, Mr. BETTERTON, Parliamentary Secretary to the Ministry of Labour, stated that officers of his department had been in constant communication with both parties, with a view to arranging a settlement of the wireless operators' dispute. The employés' Association had informed the Department that the proposals of the employers for the settlement of the dispute were unacceptable, and had submitted an alternative proposal which was being considered by the employers. Both parties included a reference to arbitration among their proposals, but differences existed between them, both as to the basis of arbitration and as to the terms upon which work was to be resumed. A com-

munication had been sent to the employers and it was hoped that it might be possible to arrange a joint meeting when their reply had been received.

On February 9th, Mr. BETTERTON said that since November 26th last, 1,258 British ships had sailed from United Kingdom ports without wireless operators.

Broadcasting.—On February 9th, in reply to questions, LORD WOLMER, the Assistant Postmaster-General, said that the total number of wireless receiving licences in force on January 31st, 1926, was approximately 1,841,000. Since the passage of the Wireless Telegraphy (Explanation) Act, last Session, there had been 28 prosecutions for installing or working wireless receiving apparatus without a licence. Twenty-seven of these prosecutions were successful and one case was dismissed. Summonses for installing or working wireless receiving apparatus without a licence had been issued against 46 persons. Seventeen of the cases had not yet been heard.

New Telephone Exchanges.—On February 9th, Lord WOLMER informed Mr. Hudson that the number of telephone exchanges opened in rural areas during the year ended January 31st, 1926, was 224. Communication with any exchange within a radius of five miles from a rural exchange was afforded at the minimum fee.

Safeguarding of Industries.—On February 9th, Sir P. CUNLIFFE-LISTER, the President of the Board of Trade, said that the number of definite applications made under the Safeguarding of Industries procedure up to date was 34. Of these, 13 had been rejected, as not disclosing a *prima facie* case, without reference to a Committee of Inquiry. Nine Committees had been appointed to consider 11 applications; and reports had been received and published in respect of nine of these applications. One application had been withdrawn. The others were either still under consideration or in abeyance.

Gas and Electrical Undertakings.—On February 11th, Mr. B. PETO asked the Prime Minister whether he would consider the advisability of arranging for the allocation of an equitable share of profits of statutory companies or municipal undertakings for the generation and transmission of electrical energy, referred to in the Speech from the Throne, to persons employed by those new undertakings on the precedent operated for many years by the South Metropolitan Gas Company and other gas undertakings; and whether he would also consider including provision for employés to invest in the capital of the undertakings and for their representatives to have a share in the management.

Mr. BALDWIN said he had watched with interest the operation of profit-sharing schemes where they had been introduced, notably in the case of gas companies. While welcoming an extension of the principle on satisfactory lines, he felt that the matter was primarily one for agreement between employers and employed.

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from February 10th :—

Symetro. No. 464,266. Class 6. Electric motors and parts and grinding machinery.—F. L. Smidth & Co., Copenhagen, and Victoria House, Victoria Street, S.W.1.

Thor (lettering and design), No. 464,601, and Thorola (lettering and design), No. 465,602. Class 8. Instruments and apparatus for use in radio-telephony. —The Reichmann Co., Chicago. (British representatives: Haseltine, Lake and Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Triggerdyne. No. 465,983. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Princes Electrical Clocks, Ltd., 173, New Bond Street, W.1.

Triumph. No. 465,615. Class 16. Electrical fuse fittings of porcelain or earthenware.—Castle Fuse and Engineering Co., Ltd., 72, Haigh Street, Liverpool.

Redot. No. 456,519. Class 18. Electric fires.—J. & W. B. Smith, Ltd.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

385. "Telephones and the like." H. J. Round. January 5th, 1924. (246,096.)

20,667. "Electric rheostats." R. Woods. May 20th, 1925. (246,189.)

22,656. "Means for generating signalling impulses for transmission over ocean cables and long land lines." M. I. Pupin. September 25th, 1924. (246,193.)

23,208. "X-ray tubes." R. K. Hezlet, V. E. Pullin, A. G. Warren, and G. D. West. July 1st, 1925. (246,194.)

23,500. "Method and apparatus suitable for receiving cable and like signals." Telegraph Construction & Maintenance Co., Ltd., and G. E. Stevenson. October 4th, 1924. (246,195.)

23,638. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), A. M. Searle, and J. H. E. Baker. October 7th, 1924. (246,196.)

25,031. "Ventilation of dynamo-electric machinery, transformers, and the like." Sir C. A. Parsons and J. Rosen. October 21st, 1924. (246,209.)

25,057. "Magneto-electric machines." British Thomson-Houston Co., Ltd., L. Griffiths, and C. Morton. October 21st, 1924. (246,212.)

25,177. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. October 22nd, 1924. (246,219.)

25,622. "Electric time-switches and other clockwork automatic lighting appliances." J. R. J. Bowden. October 28th, 1924. (246,226.)

25,819. "Electrodes for electrolytic decomposition apparatus." C. F. Holmboe. October 29th, 1924. (246,228.)

26,115. "Resistances for use with thermionic valves." H. Stevens and A. J. Stevens & Co. (1914), Ltd. November 3rd, 1924. (246,233.)

26,116. "Electric switches." H. Stevens and A. J. Stevens & Co. ((1914), Ltd. November 3rd, 1924. (246,234.)

26,118. "Means for bridging terminals of an electric circuit." H. Stevens and A. J. Stevens & Co. (1914), Ltd. November 3rd, 1924. (246,235.)

26,419. "Starters for electric motors." British Thomson-Houston Co., Ltd., G. O. Watson, and L. S. Billson. November 5th, 1924. (246,244.)

26,543. "Means for closing and opening electric circuits." C. L. T. Abalsamo. November 6th, 1924. (246,247.)

27,991. "Coupling or connection of electrical wires and the like." L. H. Reid. November 22nd, 1924. (246,263.)

28,135. "Inductance coil holders." W. Haggett. November 24th, 1924. (246,265.)

29,127. "Electric signal transmission systems." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). December 4th, 1924. (246,274.)

1925.

198. "Shade supports for electric lamps and the like." S. W. Hamlyn. January 3rd, 1925. (246,294.)

1,086. "Brush-tensioning device for dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. January 13th, 1925. (246,298.)

1,518. "Electric connectors." G. Duncan. January 17th, 1925. (246,301.)

1,852. "Construction of grid-leak for wireless telegraphy or telephony." C. Chapman. January 21st, 1925. (246,305.)

3,464. "Crystal detectors." Ideal Radiotelefon & Apparatefabrik Ges. December 13th, 1924. (244,393.)

3,806. "Cooling of enclosed electromotors and other dynamo-electric machines." Enclosed Motor Co., Ltd., N. W. Gilbert, and H. C. E. Jacoby. February 11th, 1925. (246,323.)

3,862. "Autonatic telephone systems." T. Lenaghan. February 21st, 1924. (229,651.)

3,971. "Two-wire amplifiers." Dr. H. Keller. December 10th, 1924. (244,394.)

4,342. "Variable electric resistances." J. F. Smith. February 17th, 1925. (246,325.)

4,516. "Laying of electric conductors." A. Eimers. February 18th, 1925. (246,327.)

4,627. "Electric control apparatus." C. G. N. Poolman. February 19th, 1925. (Addition to 230,207.) (246,328.)

5,480. "Sound amplifiers." J. V. Godbery. February 27th, 1925. (246,332.)

5,787. "Folding cabinet for radio-therapeutic use." T. Smith. March 3rd, 1925. (246,334.)

5,855. "Thermionic tubes." M. Heussen & Co. February 11th, 1925. (246,336.)

8,619. "Ignition systems and switches therefor." W. Hemingway, jun. April 28th, 1924. (232,940.)

8,848. "Filtering device for wireless receivers fed by the main supply." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz. April 8th, 1924. (232,210.)

8,948. "Shielding microphones and associated amplifier apparatus." De Forest Phonofilms, Ltd. (L. de Forest). April 3rd, 1925. (246,351.)

11,316. "Transformer winding for very high voltages." Maschinenfabrik Oerlikon. May 28th, 1924. (244,795.)

11,557. "Inductance coils for use in high-frequency telegraphy and telephony." A. Carpmael (Telefunken Ges. fur Drahtlose Telegraphie). May 4th, 1925. (246,359.)

12,662. "Variable electrical condensers." J. G. Newey and C. B. Jerred. May 15th, 1925. (246,362.)

12,944. "Speed-reducing gear for electric starting motors and generators for automobiles." Soc. Anon. pour l'Equipement Electrique des Véhicules. August 1st, 1924. (237,873.)

13,597. "Branch terminal for overhead lines." W. Schroeder and J. Nolte. May 25th, 1925. (246,364.)

14,029. "Electric remote control apparatus." British Thomson-Houston Co., Ltd. May 28th, 1924. (234,828.)

14,336. "Headlights for small-sized motor-cars and motor-cycles." "Fenag" Akt. Ges. Singer, F. and F. Schneider. June 2nd, 1925. (246,369.)

16,844. "Electrical regulator devices or rheostats." Metropolitan-Vickers Electrical Co., Ltd. July 19th, 1924. (237,234.)

19,035. "Insulated conductors." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Bell Telephone Laboratories Inc.). July 27th, 1925. (246,389.)

20,969. "Headlight." F. W. White. August 21st, 1925. (246,396.)

21,617. "Electric power systems." C. Meyer. May 23rd, 1925. (Addition to 208,487.) (246,401.)

21,625. "Loaded signalling conductor." Felten & Guilleaume Carlswerk Akt. Ges. August 30th, 1924. (239,231.)

21,938. "Choking-coil switches for step-up transformers with continuous regulation." International General Electric Co., Inc. September 4th, 1924. (239,514.)

22,040. "Electric condensers." Dubilier Condenser Co. (1925), Ltd. September 3rd, 1924. (239,523.)

22,852. "Combined electric switches and electric couplings." J. A. Crabtree. September 14th, 1925. (246,403.)

23,220. "Process for the manufacture of very fine tungsten wires, in particular for electric incandescent lamps." General Electric Co., Ltd. May 16th, 1925. (246,406.)

23,427. "Electric railway signalling." Siemens & Halske Akt. Ges. September 20th, 1924. (240,182.)

25,578. "Electric baths." H. Aub. October 13th, 1925. (246,412.)

25,900. "Electrical apparatus which is immersed in an insulating liquid." Metropolitan-Vickers Electrical Co., Ltd. December 4th, 1924. (244,056.)

27,944. "Electric braking systems." International General Electric Co., Inc. November 6th, 1924. (242,657.)

London Traffic Control.—The report of the London and Home Counties Traffic Advisory Committee, which has been submitted to the Minister of Transport, contains proposals designed to control the competition of omnibus companies with the tramway undertakings. It is understood that the Committee does not urge the actual restriction of the number of 'buses using the various routes, but that the number of journeys in each direction be limited. The number of journeys will be increased during the rush hours (7 to 10 a.m. and 4 to 7 p.m.). The first Order will probably apply to services running between Uxbridge and Shepherd's Bush, and will take effect at Easter. Later Orders will affect the routes between Aldgate and Ilford, Euston and Enfield, Victoria Embankment and Wimbledon, and Barnet and Acton. The statutory obligations imposed on the tramways appear to have influenced the Committee in its decision, it being of opinion that the profit obtained by the tramways in the year ended March 31st, 1922, was reduced to a loss of £153,557 three years later owing to omnibus competition. The Committee urges that some immediate check must be applied if essential tramway services are not to become bankrupt, with serious results to the travelling public.